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A KITCHEN KABINET BAND
Page 235

ATKINS SILVER STEEL SAWS

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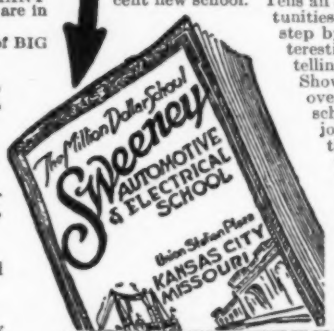

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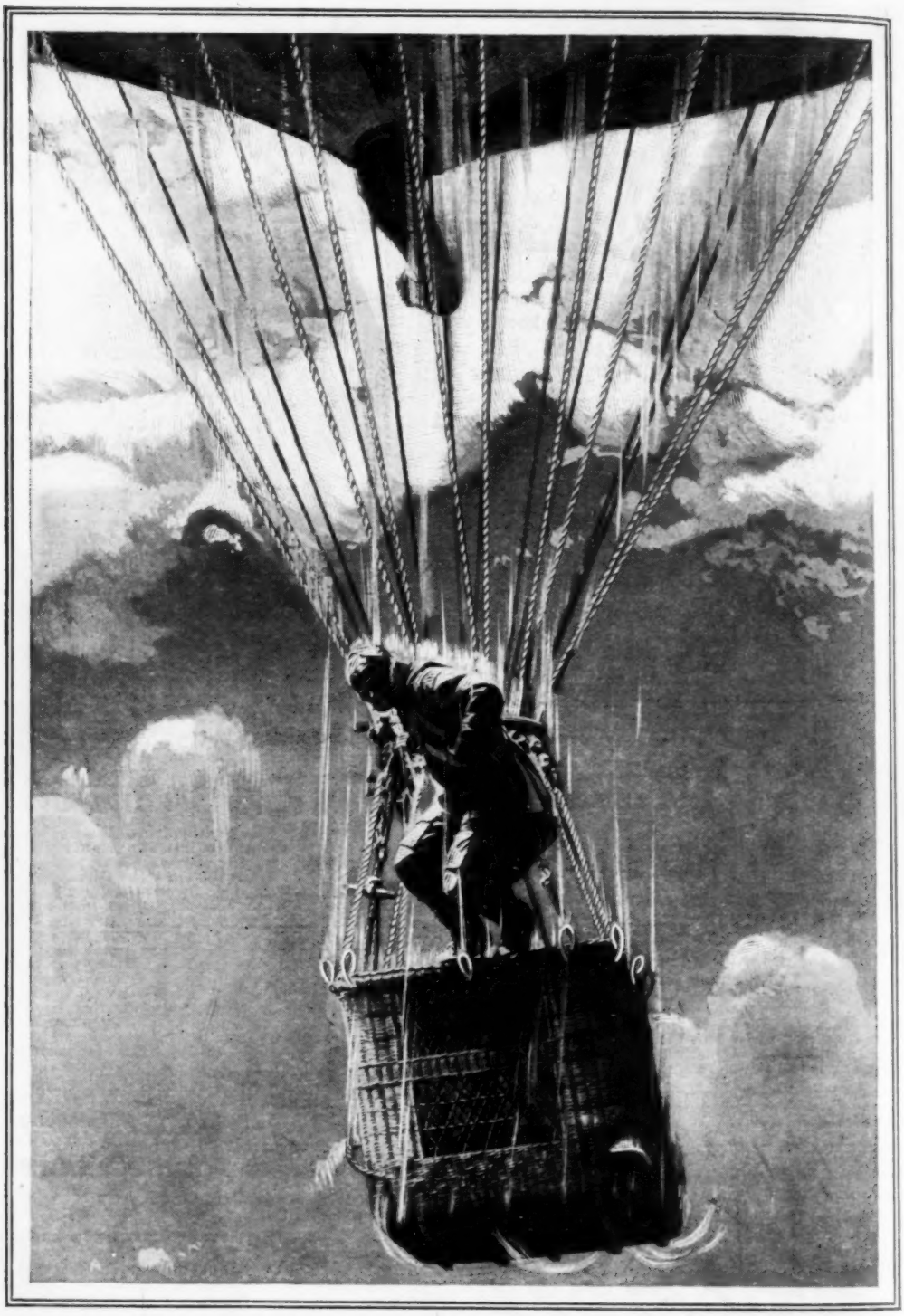

At 8,000 Feet, with His Deflated Balloon Falling Faster and Faster, Capt. Gray, World's Altitude-Record Holder, Climbed to the Basket and Leaped for a Parachute Drop

Popular Mechanics Magazine
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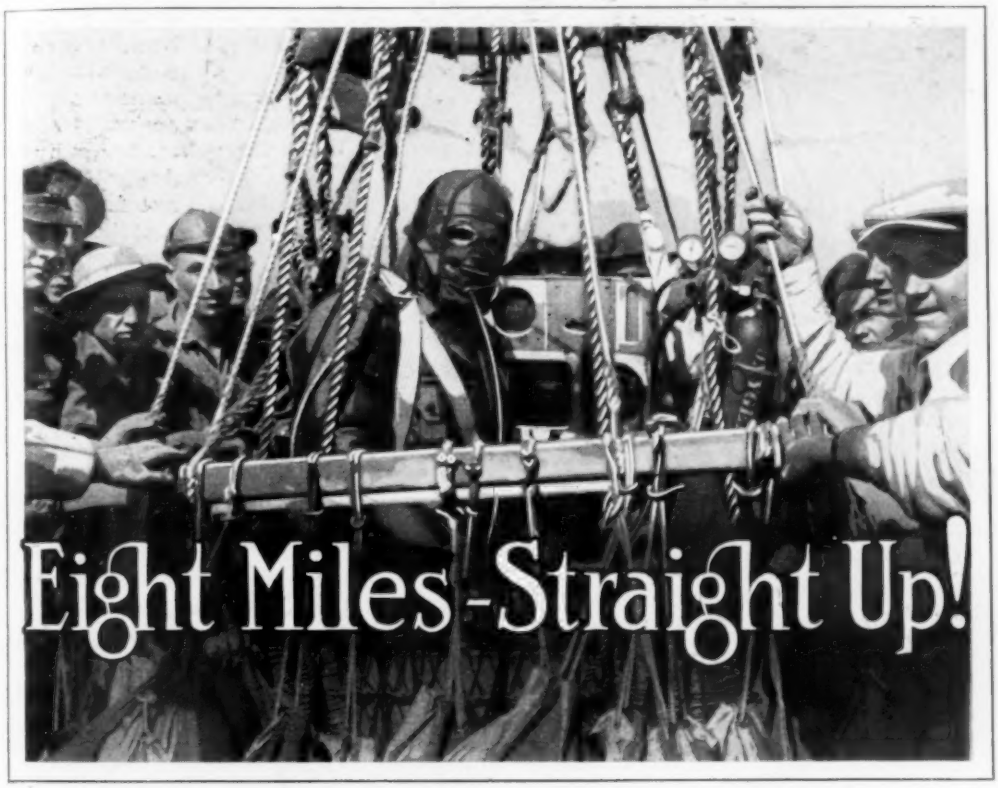


Eight Miles-Straight Up!

Capt. Hawthorne C. Gray, U. S. A., at the Start of an Attempted Record-Breaking Flight in Which He Lost Consciousness; a Month Later He Broke All World Records for High Flying

By CAPT. HAWTHORNE C. GRAY, U. S. A.
(As told to J. Earle Miller)

HOW does it feel to soar more than eight miles into the air, higher than man has ever gone before, up where the air becomes too thin to support life; where the thermometer, headed for the absolute zero of outer space, has already reached nearly seventy below zero?

A few weeks ago I did it, reached 42,470 feet above sea level, and broke every world's altitude record for any kind of craft—airplane or balloon. Within a few weeks I am going up again, confident of making more than 43,000 feet. An 80,000-cubic-foot balloon took me up from Scott field, Belleville, Ill., and once I had reached its ceiling, it brought me back so fast that I had to leave it and step off in space with a parachute to check my descent.

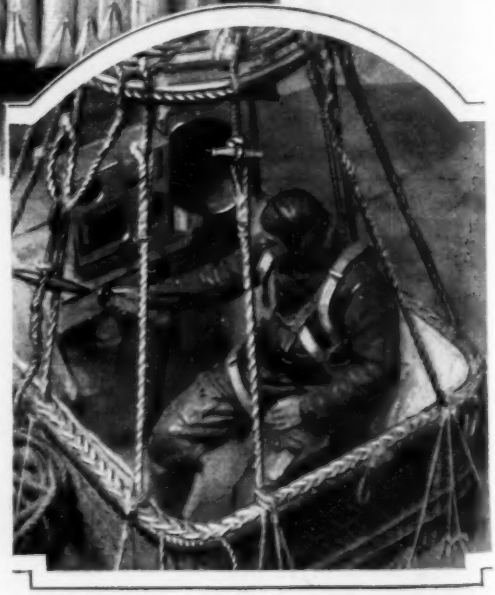
At 42,000 feet, having been kept alive by compressed oxygen for the last four miles, I was listening to a jazz orchestra playing in St. Louis, the music coming in clear and loud on my radio, without a single trace of static. That was the only connecting link with the world I had left. Far below, cruising along the top of the cloud

banks at 13,000 feet, two escort planes, one with a movie photographer aboard and the other, with the post surgeon as passenger, hovered and watched me, though I could not pick them out of the mist. Below them, the clouds covered the land, except for an occasional rift. Once, through such a crevasse, I caught a magnificent view of the Mississippi and the Missouri, tracing their winding course for miles and miles to the north and the south.

Up above, the cloudless sky was a deep, almost cobalt, blue. The dust particles that turn sunlight white were all below me and in the thin and rarefied air above, the sky was magnificent in the depth of its coloring.

At 40,000 feet I had released the last of my 4,700 pounds of sand ballast and came to a stop. But I had prepared for that by having special parachutes built to carry the weight of each piece of equipment. One was attached to an oxygen cylinder which had been emptied on the way up, and the cylinder, a twenty-five-pound steel flask, was dropped over the side. In the rare air, and weakened by breathing oxygen for some time, it seemed to me to weigh at least 150 pounds as I struggled to lift it over the basket rim. The release of its weight was sufficient to send the balloon up another couple of thousand feet — which broke the last world's record, the airplane mark of slightly over 40,000 feet claimed by a French pilot last fall.

At that height, though still distended, I knew the gas bag above contained less than one-eighth of the gas I had started with. As the balloon had climbed into lighter air and the pressure against it was

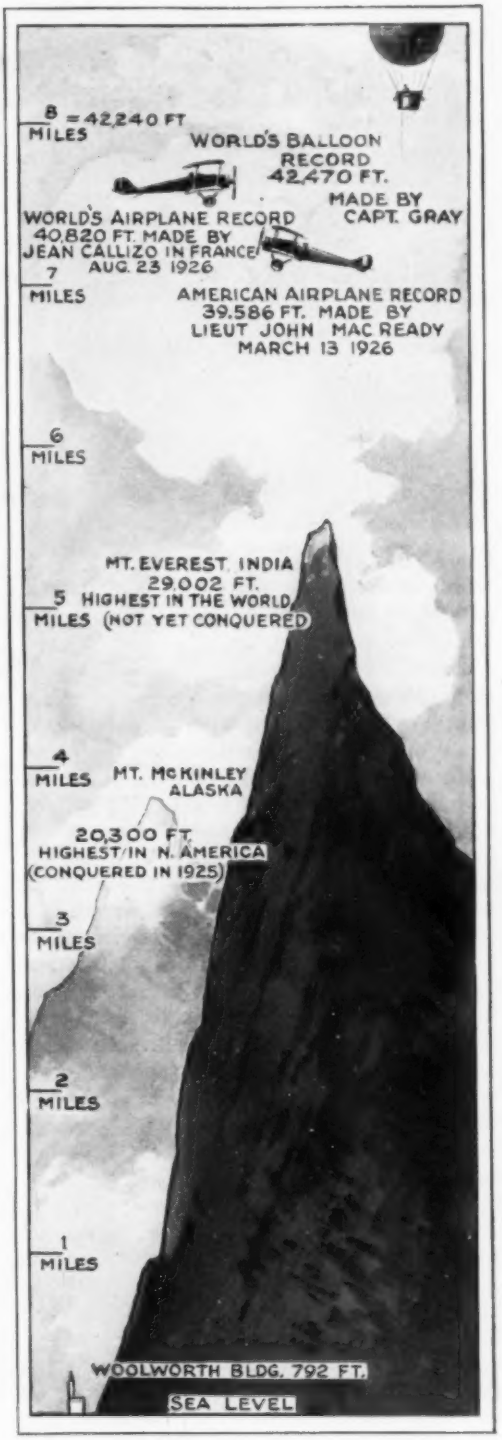


Capt. Gray Demonstrating the Usual Method of Dumping Sand Ballast; His New Sand Bags, Center, and at His Radio, Below

removed, the gas had rushed out through the big appendix in the bottom, keeping the silvered fabric from bursting. So long as I stayed up, the balloon would be full, but once I started down the gas would begin to contract under the increasing air pressure, so that if I could keep all the gas I had, there still would be less than 10,000 cubic feet when I reached the ground.

It was time to start back, and a slight pull on the valve cord, which passes up through the inside of the bag to the valve at the top, was sufficient to start the bag downward, and once started, it began to drop faster and faster, as the statoscope, which records the rate of ascent or descent, indicated. To check it, I began to attach parachutes to other articles of equipment and drop them over the side. The parachutes were designed to fall at sixteen feet a second, the same rate as the large chutes used by flyers, but the bag was falling so much more rapidly that when I dropped things over the side they appeared to fly straight up in the air, because I went past them so fast. It was queer to see twenty-five-pound steel bottles apparently flying upward. Two more oxygen tanks, the storage battery used to run the electric heater in my oxygen mask, my radio batteries and loud speaker, and finally the wooden framework which supported the sand-ballast bags, with all the empty bags still attached, were released to lighten the balloon. They served to check the descent somewhat, but not enough. Ordinarily a badly deflated balloon will flatten out and "parachute" as it comes down, but for some reason mine didn't. At 8,000 feet I got a sight over a tree top on a small marsh beyond, and discovered that the spot I was looking at kept right in line with the tree top, sure proof that my rate of descent and drift before the wind were just right to land me in the swamp. The bag was still falling 1,800 feet a minute, which is twice the safe landing speed in a parachute, so I finally was forced to leave my ship.

Climbing up on the side of the basket, I held onto the load ring above, in which all the rigging is concentrated, reached for the valve line, pulled it down and tied it to the ring, so that the bag, when it reached the ground would deflate itself. Then I jumped and pulled the rip-cord ring of my


8 = 42,240 FT
MILES
WORLD'S BALLOON RECORD 42,470 FT. MADE BY CAPT. GRAY
WORLD'S AIRPLANE RECORD 40,820 FT. MADE BY JEAN CALLIZO IN FRANCE AUG. 23 1926
7 MILES
AMERICAN AIRPLANE RECORD 39,586 FT. MADE BY LIEUT JOHN MAC READY MARCH 13 1926
6 MILES
MT. EVEREST INDIA 29,002 FT. HIGHEST IN THE WORLD (NOT YET CONQUERED)
5 MILES
4 MILES
MT. McKINLEY ALASKA 20,300 FT. HIGHEST IN N. AMERICA (CONQUERED IN 1925)
3 MILES
2 MILES
1 MILES
WOOLWORTH BLDG. 792 FT.
SEA LEVEL

Comparative Records, from the Tallest Building to the Biggest Mountains, and the Highest Airplane and Balloon Flights

Basket and Equipment for the Altitude Flight, Above, and Capt. Gray, Wearing His Gas Mask; the Canister on His Chest Contained the Electric Heater; His Flying Clothes Alone Weighed More Than Sixty Pounds

chute, and drifted downward, while the movie plane circled around and filmed the final chapter.

Freed of my weight—some 240 pounds, of which 183 were me, stripped, and the rest flying clothes—the balloon had risen slightly and drifted off before the wind, to come to earth ten miles farther on. I had lit more than 110 miles from the starting point. Before the start, I had prepared a typewritten slip and an empty envelope, to be attached to each article I planned to drop, with instructions to the finders to fill in the slips and return by mail to me. My faith in human nature was the cause of considerable amusement at the field. But within a few days after the flight, five of the seven articles—all but one oxygen cylinder and the oxygen-heater battery—had been found and notices returned to me.

The successful record-breaking flight, my 107th in a balloon, had been the second within a little more than a month. On the first, worn out by the labor of handling two and a quarter tons of sand, lifting each thirty-three pound bag into the basket, cutting the bottom with a knife, and pouring the ballast over the side, and hampered by defective oxygen equipment, I had passed out at 27,000 feet and for forty-five minutes, the barograph record showed, the balloon had drifted along at that height, until I finally recovered enough to pull the valve cord and release sufficient gas to start the descent.

Warned by that lesson, I had designed a new type of sand bag for the second flight. Instead of the usual squat canvas sack, with a drawstring at the top and a hook on the end of the string to hang it to the rigging, the new bags were long slim pouches, each of fifty pounds' capacity, with a flap door in the bottom, which was opened by pulling a cord, just as the rip cord releases the parachute.

All the bags were hung from a wooden framework suspended outside the basket, and when I got ready to cast them loose on the descent, the whole framework, with the empty bags, was released at one time.

The oxygen apparatus was improved by adding a hollow asbestos-covered cylinder, in which was suspended the electrical heating element, operated by a two-volt cell of a storage battery. The heater warmed the stream of oxygen as it passed and made

breathing much easier. With the canister, the oxygen helmet greatly resembled a war-time gas mask. Inside, however, the helmet was quite different. The oxygen tubes ended in flat metal pipes which projected right up against the glass of the goggles, so that the passing stream of oxygen would keep the glass from frosting when I reached the extremely low temperatures of the upper air. Official calibration of my instrument showed that the lowest point was sixty-seven below zero.

Next time I am going to be prepared to drop additional equipment at the top, instead of on the way down, and thus I hope to pass 43,000 feet. A lot has been said and written in the past about the coming conquest of the 50,000-foot mark, but recent research indicates it may never be realized, at least with any existing type of equipment. The doctors have found in the rebreather tests, in which men breathe oxygen in a partial-vacuum chamber as a test of their ability to withstand high altitudes, that somewhere between 40,000 and 50,000 feet there probably lies a point at which the air pressure becomes so slight that the muscles of the body can no longer function to operate the lungs, so that a man who took in a breath of oxygen could not exert enough muscular action to expel it. At that point he would die.

The action of oxygen is peculiar. I believe I was perfectly normal every minute while at the top, yet I would not swear to it, for I have watched others in the rebreather chamber and seen them try to put a finger on one button to press it and stab at something two or three feet away, yet come out declaring they were perfectly normal throughout the test and did everything correctly.

My tube thermometer was broken on the first flight, and on the second, I had no means of knowing the temperature reached, as the recording thermometer was sealed. It was not uncomfortably cold, however, as I had dressed for the occasion. Over the heaviest of woolen underwear I wore two woolen shirts, a sweater and a winter uniform. On top of that was a flying suit, leather on the outside, reindeer fawn skin on the inside, and two thicknesses of heavy woolen blanket cloth between. My flying boots were built on the same plan.

Measuring the Comfort of an Auto Seat with Instrument Devised by Bureau of Standards

AUTO COMFORT IS MEASURED TO IMPROVE CARS

How comfortable are the seats of your automobile? An answer would probably be based largely on guesswork and personal opinion, but the bureau of standards has developed a far more accurate way of telling. A gauge has been devised that registers the movements of the auto seats, at different speeds of the car, and other factors which enable manufacturers and designers to furnish upholstery and springs better adapted to comfort.

MUSICAL CLOCK PLAYS TUNES TO AWAKE SLEEPERS

Instead of a strident bell to arouse sleepers, a new alarm clock uses a Swiss music box to play a little tune. The makers claim it wakes without giving nervous people the shock caused by a loud alarm bell. Popular airs, selections from operas, and old German folk songs are some of the melodies among which a purchaser can make his selection.

Waiting for the Toss in a Roller-Skate Basket-Ball Game at Camp Normoyle, Tex., Where Sport Was First Introduced

ROLLER-SKATE BASKET BALL LATEST ARMY GAME

Basket ball on roller skates has been introduced by Lieut. Barney L. Meeden at Camp Normoyle, Tex. It was played with slight modifications of the standard game and, contrary to expectations, was not as fast as the usual sport and there were few falls. The players were men who had served on other teams and knew how to skate as well.

OCEAN DEPTH OVER SIX MILES FOUND IN PACIFIC

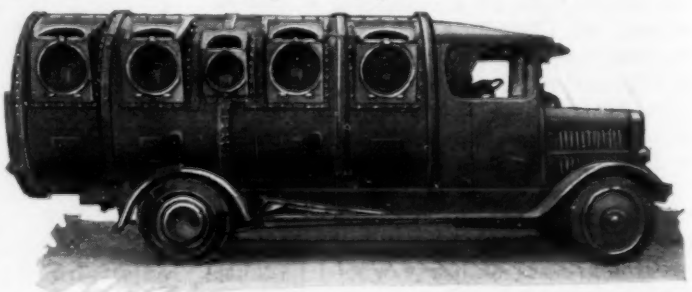
What is reported to be the deepest spot in the ocean yet recorded was measured recently by sailors on the cruiser "Emden" en route from the Dutch East Indies to Japan. The sounding was 34,416 feet, or close to 2,000 feet deeper than the previous "deepest spot" off the coast of Japan.

PROSPECTING FROM THE AIR

Organization of an aerial expedition to hunt for copper and other mineral deposits in northern Rhodesia, close to the Congo border in Africa, is under way. By means of the maps and surveys that can be made from the airplanes, the prospectors can be guided through the dense jungles to places that promise riches in ore. One of the hazards of the work is the absence of favorable landing fields. For this reason, emergency plots will have to be cut out of the forests at fairly close intervals throughout the territory that is to be surveyed and aerodromes will have to be erected for servicing the ships and keeping supplies. A special airplane has been designed for the project. It is to be fitted with two motors and so constructed that it will be able to fly or even climb with but one of the engines running.

ARMORED CAR FOR STREET DIRT REDUCES DUST

Removing sweepings from the streets in Hamburg, Germany, is simplified with a special auto truck somewhat like an armored car. It has compartments that close tightly so that dust and dirt cannot escape while the truck is being driven through the city.



Armored Car for Hauling Street Rubbish; the Compartments Are Tightly Closed, to Prevent Scattering the Contents

Paris Flight Shows Need for SPEED INDICATOR

Ryan monoplane "Spirit of St. Louis" has a speed of 100 miles an hour in still air. With a tail wind that is increased in proportion to the wind's strength, and with a head wind, it is correspondingly decreased.

CAPTAIN Charles Lindbergh's epochal non-stop flight from New York to Paris emphasized the need, in the opinion of aviation engineers, of one more instrument to make such long journeys across the ocean safe and sure. That is, some device for measuring the speed of an airplane across the surface of the earth, without the necessity of taking complicated sights at sun or stars, which are often impossible because of fog and storms.

Lindbergh reached Paris, 3,600 miles from his starting point, in thirty-three hours and thirty minutes, with nothing but an earth-inductor compass and an air-speed indicator to guide him. Fortunately, for his success, the latter not only indicated his speed through the air, but showed fairly well his actual ground speed, for he had a tail wind most of the way. Had he met head winds, however, which would have slowed down his plane and burned up his precious store of gasoline, he would have had no way of knowing the fact so long as he was flying over the ocean.

It is to offset that one great lack in flying instruments that aerial navigators are cudgeling their brains. At three-quarter throttle, the speed at which Lindbergh operated his engine throughout the flight, the Inasmuch as Lindbergh averaged about 113 miles an hour for the entire distance, he apparently had a tail wind most, if not all, of the time. So long as the air-speed indicator, which shows the plane's speed through the air, registered better than 100 miles an hour, the pilot had nothing to worry about, for the excess mileage over 100 could only be due to a wind behind him. But if the indicator had dropped to 100 he would not have known whether he was flying in still air or against a head wind, for the head wind, plus the plane's speed, would have continued to register as 100 regardless of the strength of the wind. The latter might have attained a velocity of forty miles an hour and cut the ground speed of the plane to sixty miles, and still the indicator would have shown 100, while the plane could never have reached its destination with the gas it carried. With nothing below, even in daylight, to check his ground speed by, the flyer would have sailed on, ignorant of his danger, whereas with a ground-speed indicator he could have sought safety by turning back.

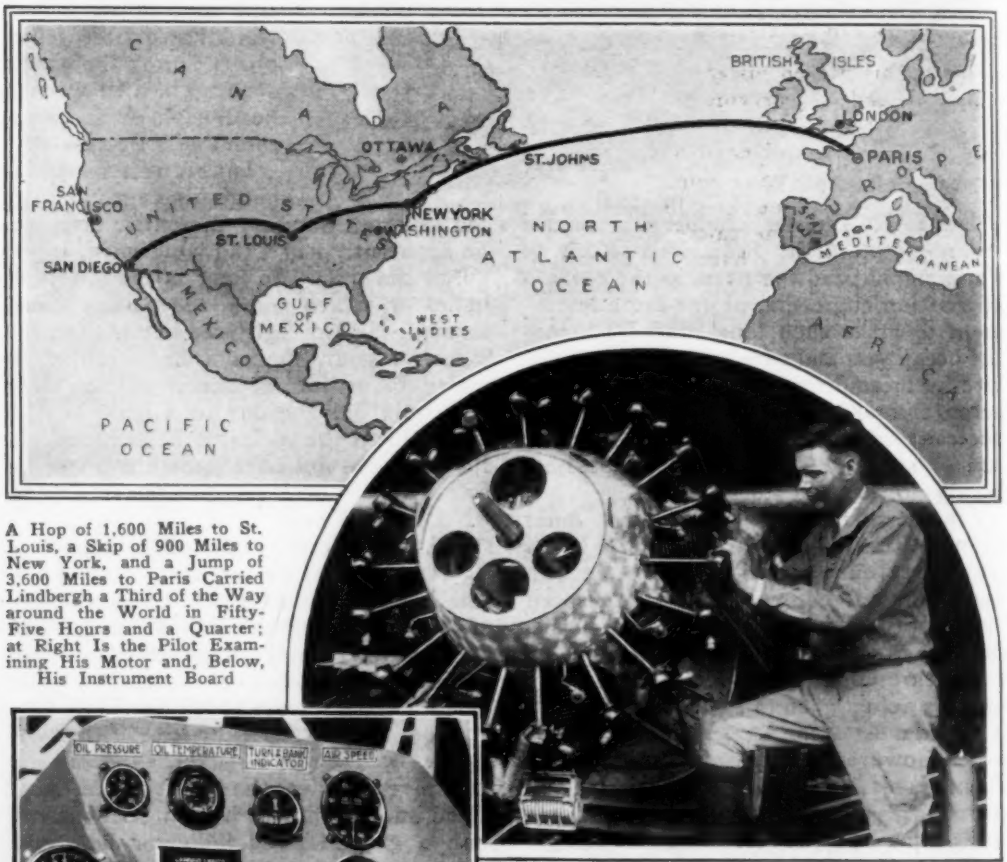
Centuries of navigation have never produced anything better than the sextant and stellar or solar observations to check the position of a craft at sea. Patent logs, to be trailed through the water, are fairly

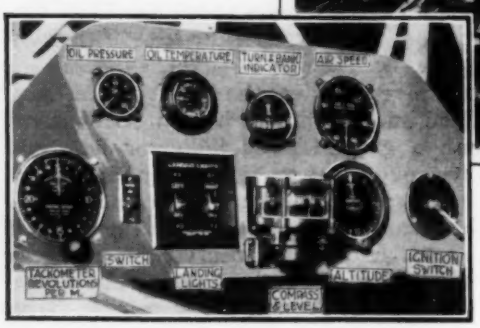
reliable, but far from being exact enough even for a surface ship to depend on.

Flying through the air over the ocean, even the trailing log is impossible. If the problem is ever solved, it may possibly come through some new discovery in radio whereby practical instruments may be developed to indicate the distance from a broadcasting station by measuring the amount of power with which the signal reaches the plane.

The Lindbergh flight brought home more forcibly than anything that has happened in aviation the high degree of perfection which planes and aerial motors have attained. That a single motor could operate, without stopping, for more than thirty-three hours, that it could do 6,100 miles without overhaul, and still be ready to continue, proved a revelation to many who have not closely followed the improvements made in flying. Lindbergh's average speed from New York to Paris was 113 miles an hour. A few days later, at Indianapolis, ten of the finest racing creations in the automobile world were worn out in the first half of a 500-mile race while trying to meet the 109-mile-an-hour pace set by the leader.

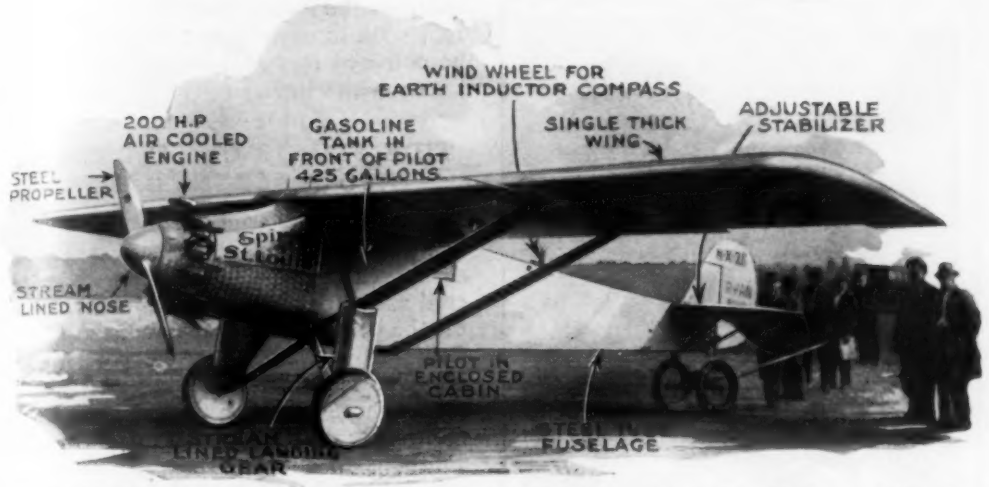
The air-cooled motor, which Byrd used in his flight over the north pole and which Chamberlin and Acosta used in setting a new world's duration record, has proved ideal for flying. It eliminates the weight of the radiator and its water supply, and also all the manifold possibilities of broken





A Hop of 1,600 Miles to St. Louis, a Skip of 900 Miles to New York, and a Jump of 3,600 Miles to Paris Carried Lindbergh a Third of the Way around the World in Fifty-Five Hours and a Quarter; at Right Is the Pilot Examining His Motor and, Below, His Instrument Board

water connections and clogged tubes, or a fractured radiator pipe. Every tube, pipe and joint on a plane is a liability, since the failure of any one of them is usually sufficient to force a flyer down.



The "Spirit of St. Louis" in New York, and Some of the Principal Features of the First Airplane to Bridge the Gap between Two Great Cities on Opposite Sides of the Atlantic in One Flight

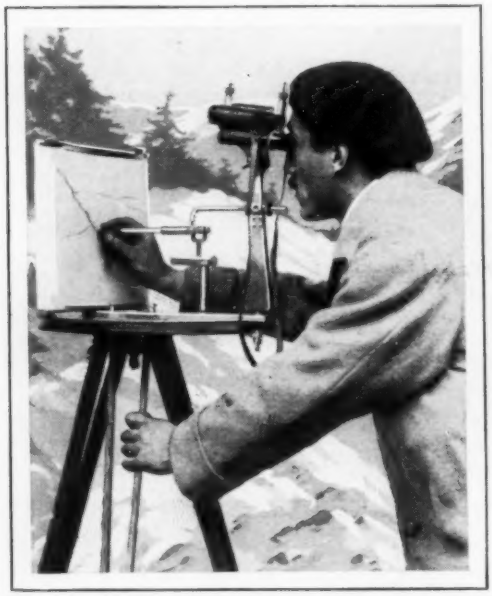
In staking his life on his earth-inductor compass, instead of carrying the excess weight of a companion to act as navigator, Lindbergh likewise was not taking such extreme chances as many might think. Loss of flying speed due to a head wind would have upset all the calculations on which his navigation was based, but, with the exception of that one possibility, his method of flying was fairly safe.

The earth-inductor compass is not a compass at all, in the usual meaning of the term, since it does not employ a floating needle to be attracted toward the magnetic north. He carried a magnetic compass, too, but they are far from being reliable in the air, since the presence of the mass of metal in the engine and the electrical effect of the ignition system make them difficult to correct. The earth inductor is nothing but a small electric generator, driven by a tiny air fan, a "dummy" compass dial by which the electrical field of the generator can be varied, and a galvanometer, which looks like the familiar "charge" and "discharge" ammeter on the automobile instrument board. The generator is placed far back in the tail of the plane, to remove it from the electrical influence of the ignition system. Its vertical shaft projects up through the body of the plane and carries a little two-bladed wind propeller, as the photographs of the "Spirit of St. Louis" show.

In flight, the aviator charts his true course, and then turns the dummy compass pointer to the route chosen, upsetting the magnetic field of the generator in its relation to the earth. Then he swings his ship until the galvanometer hand rests on the top center of the dial, and is then on his chosen course. Any variation to left or right will cause a corresponding deflection of the needle, just as the ammeter hand on the automobile swings to one side for charge and the other for discharge.

To fly across the Atlantic, Lindbergh plotted his course in advance, basing it on the great circle, which is the shortest distance between two points on the earth's surface. Actually he did not fly a circle, but rather a series of short legs of 100 miles or so each. As plotted, his course required him to fly one hour in a fixed direction, then reset his compass for another hour, and so on. Since all the courses, or one-hour legs, had been calculated in advance, the changes were simple to make.

The feasibility of transatlantic flying was further strengthened only two weeks after Lindbergh's flight when Clarence Chamberlin and Charles A. Levine flew almost to Berlin in their Bellanca monoplane. They remained in the air for forty-two hours, finally running out of gasoline and descending within 110 miles of Berlin, at Eisleben. That was at 5:00 a. m., Berlin time, after nearly two days and nights in the air, yet they immediately regassed and took off again, but, becoming lost, finally descended seven hours later, still 70 miles from the German capital.



Guiding the Hand through the Binoculars; Profiles Are Easily Copied with Braced Pencil

BINOCULARS ON DRAWING BOARD AID IN DRAWING MAP

For use in various kinds of topographical work, French engineers have devised a binocular addition to the drawing outfit. It is so adjusted that the contour of distant hills or other objects can be accurately followed by the hand in tracing on the paper. The pencil is braced for greater steadiness and ease in operation.

UNDERGROUND POLICE TO GUIDE TRAFFIC IN TUNNEL

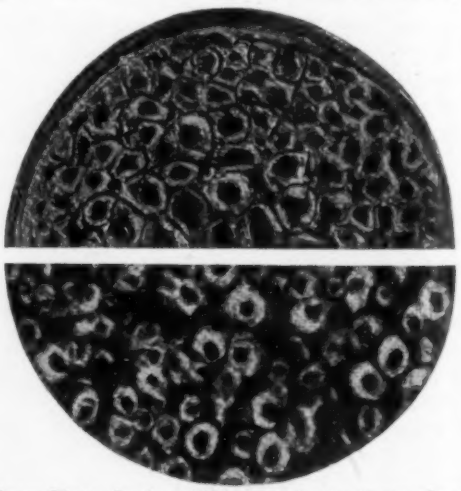
What is believed to be the first underground police force ever established has been enlisted to supervise traffic through the new vehicular tunnel under the Hudson river in New York City. They will have signal boxes every 400 feet to flash electric signs such as "Stop All Traffic," "Stop Your Motor," "Accident, Halt," and "Fire." Electrical emergency wagons, equipped with powerful jacks, will be stationed at all entrances and exits, ready to respond to calls to haul out disabled vehicles. In case of a fire, the ventilating drafts can be regulated from the signal boxes so that an increased suction can be induced, to draw off the smoke and flames through the outlets. Three hundred men are to compose the force. They will have a three-foot walk in each tunnel and vehicles will be confined to two ten-foot passages between white lines.

TIDE FLOATS GIANT GAS PIPE INTO PLACE IN CHANNEL

An interesting engineering feat was accomplished recently when a stretch of eight-inch gas pipe, 600 feet long, was lowered as a single unit into the eastern end of the estuary that separates Alameda, Calif., from Oakland. The pipe, welded into one length, was constructed parallel to the shore and then floated out on pontoons. Ropes were passed underneath the pontoons to support the pipe, and while one end was held fast to the Alameda side, the other was allowed to drift with the incoming tide, which swung it into place.

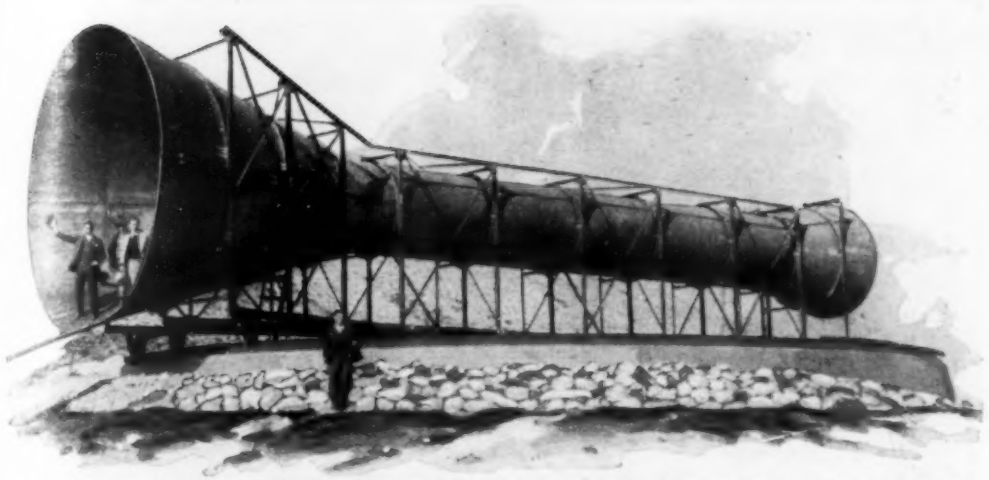
PHONE CABLE LIKE SPINAL CORD PHOTOGRAPHS SHOW

Telephone lines have often been compared to the nerves of the human body, and the analogy is further carried out by cross-section photographs of a cable and those of transverse sections of a human spinal cord. The separate nerves of the



Upper Photo, Section of Telephone Cable; Lower, Cross Section of Human Spinal Cord Magnified

cord are comparable to the individual wires that make up the cable, while the ganglia, or nerve centers, have somewhat the same function as the various "centrals" in a telephone system.



Turntable Funnel to Generate Electric Power from the Wind; It Can Be Swung to Get the Full Benefit of the Breeze, and Is Intended to Operate Ten Turbines

REVOLVING FUNNEL TO MAKE WIND GENERATE POWER

Mounted on a circular track so that it can always be pointed toward the wind, a huge funnel has been constructed by a California inventor for harnessing the breezes to generate electricity. The entire apparatus weighs about eighteen tons and is intended to so compress the wind that it will operate ten turbines as it rushes through the tunnel. These, in turn, would be made to actuate generators for making electricity. The inventor has calculated that as much as 1,445 horsepower can be derived from the wind with this outfit and, if it proves a success, he will erect others in localities where strong winds prevail.

PLAYING TAG WITH WHALES

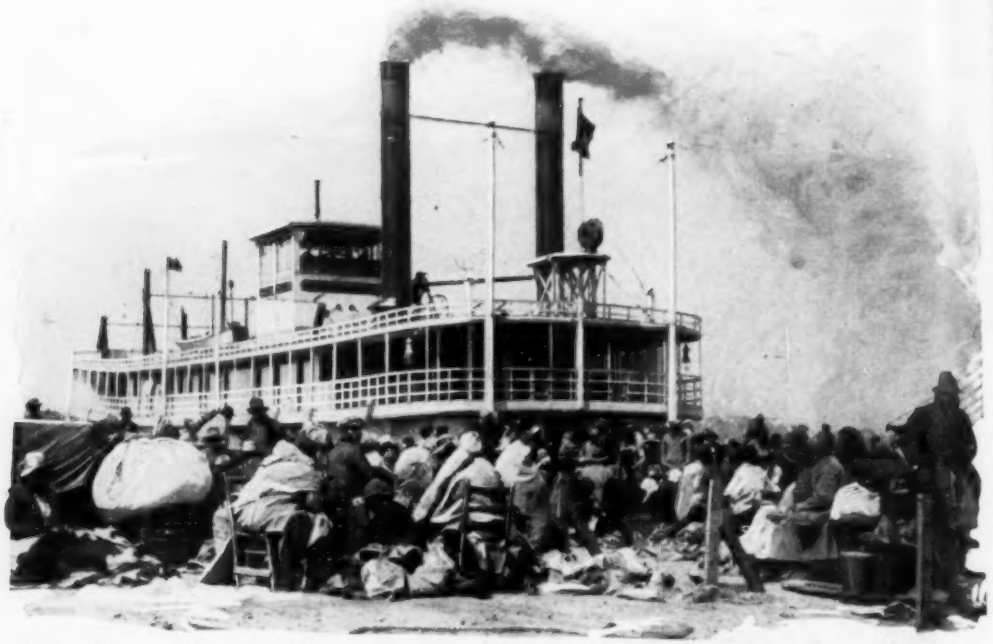
To learn more about the habits and travels of whales, Norwegian fishermen are tagging them with metal labels. A specially designed crossbow is used to shoot a small dart, bearing the tag, into them and when a tagged whale is captured, a report is made to the Norwegian fishery headquarters, giving the data appearing on the tag and where and under what conditions the whale was caught. This system of tagging fish is not new. As early as 1653, Izaak Walton made mention of a study of the homing instincts of salmon by tying ribbons to the tails of the young fish, and for more than twenty-five years the United States has been tagging cod, mackerel, salmon and other species. Up to April of this year, 3,565 codfish had been tagged and fifty-two of the number had been recaptured.

BEAUTY PARLOR FOR PET DOGS SAVES OWNERS WORK

Dogs have a beauty parlor of their own in Paris where they receive hair cuttings, trimmings and curling, skin treatments and baths to keep their fur glossy. Sickly pets are given ultraviolet ray applications. Each morning, "customers" arrive in the arms of their mistresses or maids and the shop is doing a large business.

Courtesy L' Illustration

Bathing and Curling the Pet Dogs in the Canine Beauty Shop; "Dressing" Them for Shows Is a Specialty



Rescue Steamer at Greenville, Miss., Loading Refugees from the Levee Top to Transport Them to Red Cross Relief Camps; the Flood Victims Clung to Vast Bundles in Their Flight

Can the Mississippi Be Tamed?

Engineers Debate Need of Returning Part of Bottom Lands to River to Supplement Levee and Reservoir System

WHAT to do with the Mississippi river to prevent disastrous floods in the future is a problem perplexing the engineering brains of the nation as a result of the unparalleled damage done this year.

Three schools of flood prevention have existed for years, so none of the ideas advanced are exactly new, but the widespread failure of the levees in the highest flood in history, due to rains falling for months over practically all of the Mississippi watershed, has emphasized the differences between them. One group has always advocated flood control through the levee system alone. A second favors abolishing all levees except those protecting river-bank cities, allowing the river to take back its former overflow land. The third idea is to combine levees with a series of dams in the upper river and the main tributaries, the dams being designed to hold back the flood water in vast storage pools, releasing it in time of low water to maintain navigation levels, and at the same time using the storage waterhead to generate electric current.

Old-time river men, who bitterly denounce the levee system, declare that so long as dikes are built to retain the river in its main channel, the river will keep on depositing silt in the bottom, raising itself higher and higher, and force the extension of the levees upward, without end. In the old days, they claim, the river overflowed the bottom lands every two or three years and deposited a rich covering of silt, ranging from a few inches to as much as three or four feet. Always, however, the water drained back into the main channel in time for spring planting, with the result that the river bottoms, enriched by the silt deposit, were the finest cotton plantations in the world.

Then came the levee system, and the bottom lands, deprived of their natural fertilization, were exhausted so that now,

Levee Tops Were the Only Safe Refuge When the Mississippi Poured through the Broken Dikes, and for Hundreds of Miles Thousands of People Pitched Their Tents in the Midst of the Flood

On the Upper Mississippi Cows Were Milked in Water Nearly Knee-Deep, and Horses Had to Swim to Pasture

Speed-Limit Signs at Hollandale, Miss., Were Strictly Obeyed When the Residents Were Forced to Take to Rowboats to Travel between Their Submerged Homes; Families Lived on Second Floors and the Upstairs Windows Became Doors for Those Not Entirely Flooded Out

even with artificial fertilizer, they will not produce the cotton they did in the past. And the silt, which formerly enriched the bottoms, drops to the river bed and raises it higher each year, making for worse floods in succeeding seasons.

Col. Robert Isham Randolph, one of the flood engineers who studied the question during the recent high water, declares that many of the hundreds of thousands who were driven from their homes should not be permitted to return, but should be settled elsewhere and provided with farms. The bottom lands should be returned to the river, and used only for grazing or fish and game preserves, he says, leaving them open to absorb the surplus flood water. The trouble with the river, he claims, is that men have attempted to settle the bottom lands before nature finished making them. Left alone, the river would have kept on depositing silt in the bottoms until they were built up in vast savannas as high as the highest flood, and the river would then have dug itself deep in its own channel and stayed there.

The river tributaries with their connecting swamps and marshes in Missouri, Arkansas and Louisiana, he says, show plainly that they formerly served as an overflow channel to the Gulf of Mexico, and some provision should be made, with artificial connections, to restore them to that use, so that in time of high water part of the stream could be diverted into relief channels, instead of passing the entire burden down the main river. The proposal of controlling the flood at its source through reforestation is impractical, according to Col. Randolph, first because it takes too long to grow the trees, and secondly, because it would take a forest area equal to Montana, the Dakotas, Minnesota, Wisconsin, Ohio, Illinois, Indiana, Iowa, Nebraska, Kansas and Missouri to reduce the flood crest five feet at Cairo, Ill., where the Ohio joins the combined waters of the Mississippi and Missouri.

The increasing damage from the recurrent floods is largely due, engineers admit, to the cutting of the northern forests and the building of cities where they stood. Every paved street, city sewer and every farm drain tile helps make the floods worse by carrying the water rapidly to the river, instead of leaving it on the ground

Courtesy Illinois Central System

Millions of Tons of Water Beat at the Cement Wall Guarding Vicksburg's Lowlands, While Pumps on Freight-Car Tops Returned the Seepage to the River

where it fell. Since the Mississippi drainage basin includes about two-thirds of the area of the United States, the water carried off through these three agencies alone is enormous.

The Mississippi levee system, which failed this year, is one of the greatest engineering feats ever undertaken as a means of flood control. From Cairo to New Orleans, for 2,000 miles, they stretch along both banks of the river at every low spot, and in the southern states arms extend for hundreds of miles up the many tributary streams and bayous. The levees are built of earth, usually dredged up from the river bottom several feet out from the bank. In height and width they conform to specifications laid down by the United States Mississippi river commission, which was created by an act of congress back in 1879, the avowed purpose being to "correct, permanently locate and deepen the channel and protect the banks of the Mississippi river, improve and give safety and ease to the navigation thereof; prevent destructive floods; promote and facilitate commerce, trade and the postal service." The national government has paid two-thirds of the cost of the levees and local levee boards the other third. The standard levee top has been three feet above the crest the 1912 high water would have reached had it been confined to the river channel. The flood this year topped the levees at Vicksburg by six-tenths of a foot, however, even after millions of acres had been flooded. Had all the water been kept within the banks, the flood crest there would have been ten feet or more above the 1912 flood mark.

One effect of this year's flood was the covering of Louisiana's famous muskrat marshes, from which the state each year extracts furs worth millions. The state conservation department built 1,500 rafts of logs covered with marsh grass, stocked them with muskrat food, and turned them loose in the marshes to provide floating homes and provision supplies for the muskrats, whose situation was as serious as that of the 300,000 humans driven from their homes. Trappers were assigned to watch the rafts and keep illicit fur gatherers from killing off the rats. They estimated that half the muskrat population was saved.

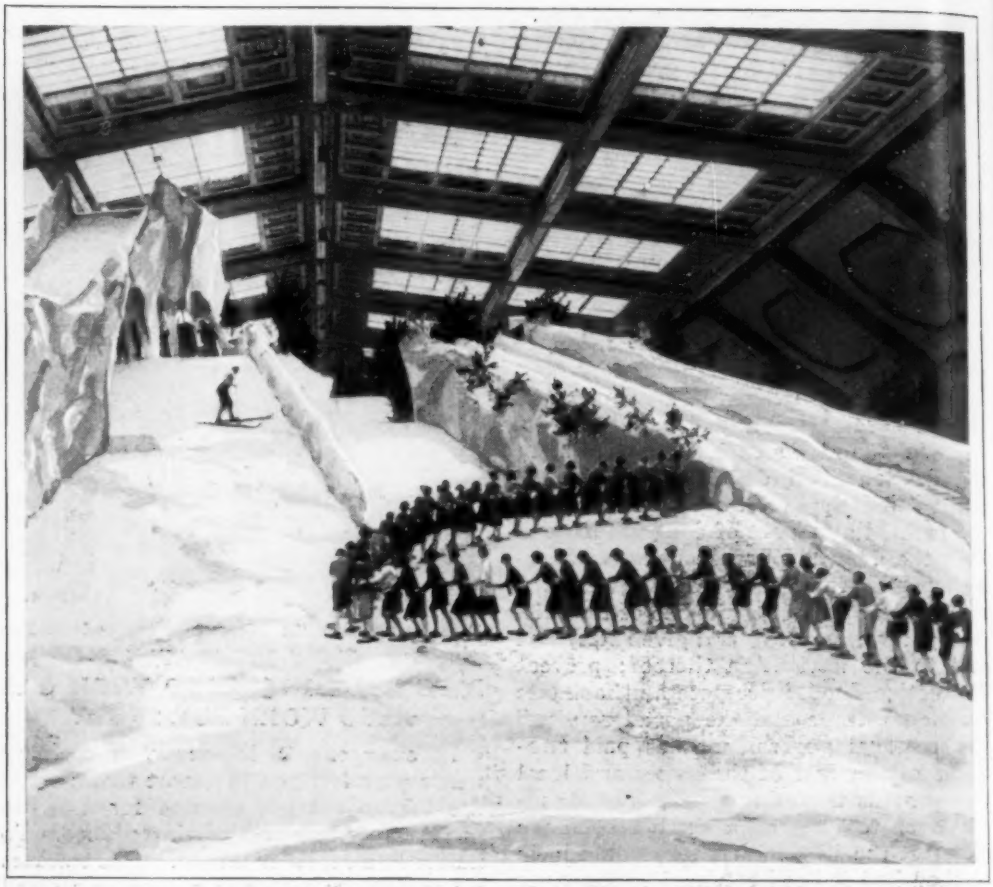
Releasing the Gas, the Chamber Filling, and the Preserver Inflated for Service

LIFE BELT INFLATED WITH GAS ALSO WORN FOR SPORT

In emergency a life-saver, in ordinary use, a practical belt for sport wear; these are the advantages claimed for a swimmers' safety unit recently introduced. To inflate it, a screw is turned. This releases a buoyant gas which is carried in a small container. The vapor fills the belt, which is folded in such a way that it forms a chamber.

MANICURE KIT IN SMALL TUBE INVENTED BY WOMAN

A complete manicure set not much larger than a "compact," has been devised by a woman inventor. In one end of a small cylinder is a removable tube of nail polish, in the other nail white and cotton for its application. A buffer, file, emery board and manicure stick are attached to the cylinder. The kit takes up little room in a handbag and is neat in appearance.



Fun in the Winter-Sports Palace the Year Around; Chemical Snow Is Used, But Proves Satisfactory for Ski and Snowshoe Practice, and There Is Also an Ice Rink

PLAY WINTER SPORTS ALL YEAR UNDER PALACE ROOF

Winter sports can be enjoyed at all times of the year in a huge building recently opened in Berlin. There are ski runs, toboggan slides and ice rinks. An artificial substitute for snow is used, but proves satisfactory as the grades of the slides are steep. The dimensions of the palace are such as to permit large crowds enjoying it at the same time.

PAINTING DOME OF U. S. CAPITOL TAKES THOUSAND GALLONS

One thousand gallons of special paint were required recently, to cover the dome of the United States capitol with a protective coat. The liquid was prepared by a formula approved by the bureau of standards and is expected to withstand several years of exposure. More than a week was required to scrape off the old paint.

WATERPROOF STRAW HAT HOLDS SHAPE IN ANY WEATHER

Adapted for the beach, hiking or street wear, a straw hat, made waterproof by chemical treatment, has been placed on the market. It is said to maintain its shape in wet or dry weather, is light and pliable and does not tear. Hand-woven palm fiber is the principal material used in manufacturing the hat.

KEROSENE BATH FOR GOLDFISH CURES THEIR ILLS

If your goldfish seem listless and ailing, there is hope of a cure for them, although owners are strongly advised against experimenting with treatments just because they have proved successful in some cases. A competent aquarium expert should always be consulted if you value your pets. Miss Ida M. Mellen of the New York aquarium, recently discovered two simple remedies that proved effective in curing some sick goldfish brought to her for treatment, a kerosene bath and a bath in a solution of aluminum sulphate. Twelve large comet goldfish were allowed to stay in a bucket of kerosene for one and a half minutes, one at a time. Then they were placed in a reserve tank of fresh water into which a strong flow of salt water was introduced. The fish recuperated and in ten days were bright and shining. The aluminum-sulphate treatment proved effective in curing thirty common, straight-tailed fish from a park lake. Evidently, they had been poisoned by automobile oil draining into the water. Some were in an almost hopeless condition. They were left in a solution, one ounce of aluminum sulphate to a gallon of water, for one to three minutes. Only two died, the rest improved.

CAVALRY KITCHEN IS MOUNTED ON A HORSE

All necessary equipment for preparing and serving a meal is contained in a kitchen-pack outfit that has recently been designed for cavalry units of the United States army. It is easily carried on one horse, as it weighs only 200 pounds, and can be put together in less than a minute. It is intended for emergency use when the big rolling kitchens find it impossible to maintain contact with the army forces.

Compact Army-Kitchen Outfit Being Adjusted to Horse; It Weighs but 200 Pounds Complete

Manicuring by Electricity; the Motor Is Inclosed in Dome Unit in Front

ELECTRIC MANICURE SET SAVES CUSTOMERS' TIME

Manicuring by electricity has been introduced in Los Angeles at a reported saving in time and with an improvement in the work. A motor-driven unit occupies but little space on the table. A flexible shaft turns different attachments for polishing and buffing the nails.

ALASKAN CABLE CUT BY WHALE

Cable communication between Seattle and Alaska was interrupted for a month recently when a whale attacked the submerged line. The cut was repaired by the army cable ship "Dellwood," which brought the cable to the surface along with the whale, which was hopelessly entangled in it. The animal had completely severed the core of the cable by its teeth in eight places. Since the inner covering is made of gutta-percha and heavy iron armor, some idea of the whale's biting strength is obtained. It was a member of the killer species, weighed twenty tons and was twenty-eight feet long with maximum girth of nineteen feet.

Adventures in

By J. EARLE MILLER

WOULD you believe there is a land where:

Fish come out of the water and inflate themselves with air like rubber balls?

Deer are so small they can be carried home in the pocket and cooked whole in a frying pan?

Full-grown bears are only fifteen inches high?

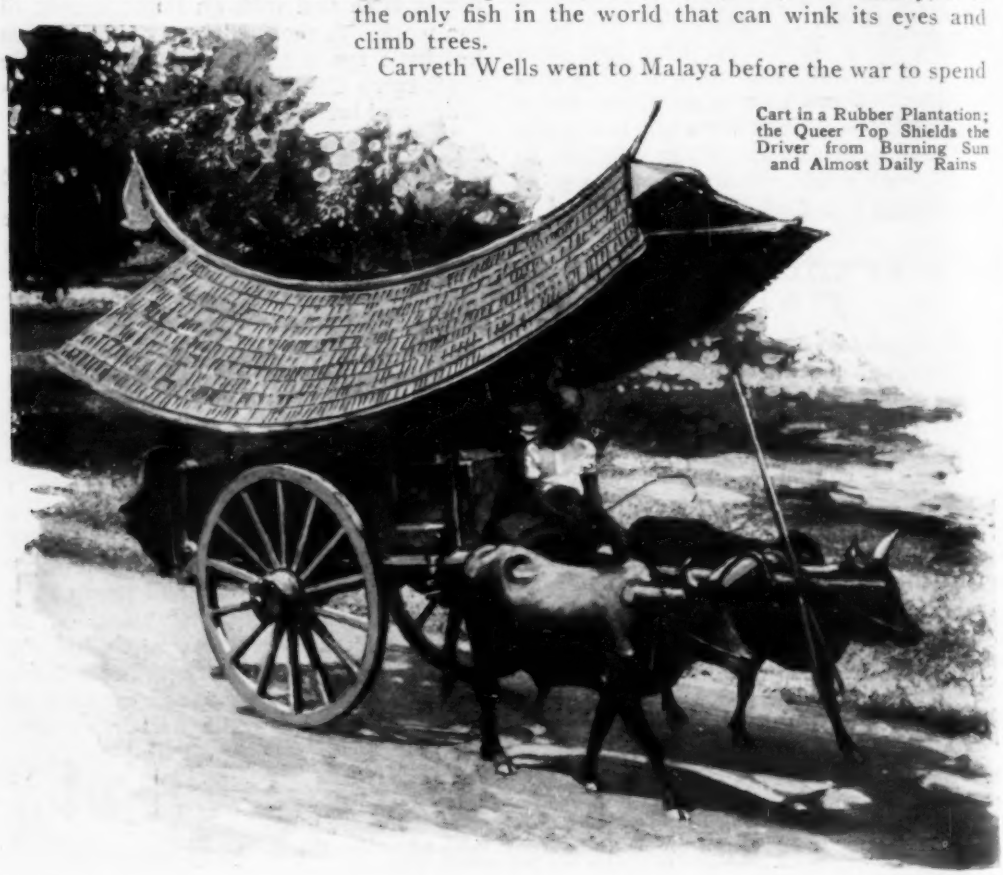
Fish climb trees and blink their eyes?

There is such a land, and Charles Darwin, who years ago named it topsy-turvy land, only half described it, according to Carveth Wells, English railroad engineer, who spent six years in the jungles of the Malay peninsula building railroads and surveying roads across its unexplored interior.

Imagine walking along the beach and seeing a fish come up out of the water, cross the sand and climb a tree, "and," says Mr. Wells, "I watched and, after a few moments, it came down and returned to the pond."

Nothing that Sindbad the Sailor told can rival that story, yet there is such a fish and you can see it in museums tagged Periopthalmus Schlosserii, and, incidentally, it is the only fish in the world that can wink its eyes and climb trees.

Carveth Wells went to Malaya before the war to spend



Cart in a Rubber Plantation; the Queer Top Shields the Driver from Burning Sun and Almost Daily Rains

© Burton Holmes

TOPSY-TURVY Land

Malay Boy's Costume of Wide Trousers, Sarong and Blouse, and His Musical Instrument

two years surveying a railroad up the peninsula toward Siam, but the war came on and it was impossible to relieve him, so he spent six years in the jungles before he was finally invalided out.

Imagine hunting for deer that are only nine inches high and that can be lured from the forest by beating a rat-a-tat-tat on a palm leaf; killing twenty-foot boa constrictors with the iron-shod end of a surveyors' pole; photographing forest dwarfs so shy even their native neighbors rarely see them; crossing an unmapped wilderness to find a health resort where the wild elephants go to take the mud baths when they think they are about to die; watching fish fights between finny battlers that are trained like fighting cocks, and meeting birds who seal their mates in hollow trees at nesting time and feed them for weeks on a diet of strychnine.

He did all those things and many more.

"One day," Wells relates, "I was walking through the jungle when I became thirsty. One of my natives walked over to a tree and cut off a section of large vine, about three feet long, holding it carefully with both ends level. He told me to kneel and open my mouth, when he poured out of the apparently solid wood a stream of delicious cold water.

"I went to the same vine and cut off a section, but it was dry. 'Of course,' the native said, 'you made too much noise so the water all ran down to the roots.' I tried that many times, and always found water if I approached quietly, but a dry vine if I scared it!"

He found a plant in Malaya that folds up its branches, closes its flowers and lies flat on the ground if you touch it or even breathe upon it, though it will stand up in the face of a brisk wind. A buffalo feeding at the edge of a patch will make the whole field lie down.

He met a Malay bird about the size of a hen that lays an egg almost as big as itself, buries it in a shallow hole, covered with twigs, and when the egg hatches, the chick flies out, to a tree top, for its wings and feathers are fully formed within the shell.

Occasionally a little band of wild elephants was met, or, usually when the almost daily rains drowned out the noise of

Carveth Wells with a Malay Fire Maker, Which Employs the Principle Used in the Diesel Engine

approach, some other animal would be seen, but such sights were rare. There is plenty of rain, some 250 inches a year, and a nine-inch shower in three hours is more or less common, while his surveyors' rain gauge, with a ten-inch capacity, frequently overflowed in a single afternoon. The rains, however, usually arrive on schedule at the same time each day, so a morning could be spent surveying and the afternoon inside working on the field notes. It was not unusual to walk away from home in the morning and return in the afternoon by boat, the rivers rising so fast they would overflow the clearings to a depth of two or three feet.

Insects and their neighbors were the worst curse of the jungle. To live in any comfort in one of the palm-thatched native huts, it is necessary to erect a tent inside to keep off the things that live in the roof. Cockroaches arrive first, to eat the palm fronds. Then lizards arrive to eat the roaches, and in turn come scorpions, rats, mice, centipedes, frogs, spiders and other things, each living on the others, until the snakes come to eat all of them.

Chicken three times a day is the usual diet prepared by the cooks, most of whom are Chinese. Running a household in the jungle, or even in one of the sea-coast cities is no easy task. Each morning the cook inquires how many are expected for dinner and asks for a certain amount of money for his shopping. Rarely is there any change. If the employer objects and tries to do the shopping himself, there is an astonishing increase in prices, so that, in the end, it is cheaper to let the cook get his rake-off. In the jungle, though hundreds of chickens are kept in the coops, there are never any eggs, for they are part of the cook's graft and must be purchased back from him. Sometimes the cook helps out his private income by selling the same chickens several times before they are eventually eaten.

On a fishing trip with a Malay boy, the youngster carried twenty or more small rods, about two feet long, to a rice field and stuck them among the growing grain with the baited hooks in the swamp water below. When all were in place, he began making the rounds, taking little fish, three inches long, from each. After catching a hundred or so, they returned to land, and the boy began stroking the fish across the ground, whereupon they promptly filled themselves with air until they could be bounced like rubber balls.

The Malays are not fond of work, and seldom do any, beyond cultivating a rice field. Most of their food comes ready prepared and nature grows it without assistance. One species of monkeys is trained to climb coconut palms and throw down the fruit. The monkeys know two words of Malay, meaning "ripe" and "green," and will throw down either kind of coconut asked for.

Because of their disinclination for work, the Malays declare one of their favorite fruits, the durian, is not good until nature drops it off the tree; so when the durians begin to ripen, they build a small fence around the tree to keep out animals, and

The Water Buffalo, Used in Rice Fields, Can Smell a Foreigner a Mile Away and Charges on Sight

Above and at the Right Are Two Views of a Royal Princess' Costume; the Veil, of Pure Silver Mesh, Weighs Seven Pounds and Covers a Jacket of Gold and Silk

Ready to Draw a Fold of the Veil across the Eyes; the Malays, Being Mohammedans, Require Women to Cover Faces When Abroad; Veil and Sarong Are of Silk Batik

within the inclosure a hut in which they can rest and chew betel nut until the durians drop. A durian, according to Wells, is about the size of a football, tastes like a mixture of custard, turpentine and overripe onions, but nevertheless is good to eat, after the taste is acquired.

Railroading in the jungles is unlike that anywhere else. On ordinary surveying it is often possible to run lines of a mile or more at a time, and in the western states the government surveyors, working on mountain tops, have run lines more than 150 miles long. But in the jungle, the vegetation is so thick that a sight of a hundred yards is often difficult, and because of the incessant hacking away of vines and bamboo to clear the path, a quarter or half mile is a good day's work.

Malays were used in the surveying party, but when the actual building of the roadbed started, Chinese coolies were imported. Each carried a tool that was a cross between a rake and a hoe, and two baskets suspended on a shoulder rod. When the baskets were filled they were carried up the slope and deposited on the right of way.

The Malayans make most of the things they use, even to guns. When a gun barrel is wanted, a length of iron rod will be buried upright in the ground, a native drill,

Row of Palms in Penang, and a Typical Malay Dugout with Its Small, Crude Sail

weighted down with a box of stones, placed above it, and with a loose bow string twisted around the drill, a native will sit on the ground and saw away for weeks and months, slowly boring a hole through the rod.

Most of their utensils are crude, yet they often employ scientific principles that are remarkable even in civilized countries. When Diesel invented the engine bearing his name, employing the heating of the air during compression to explode the gas, it was considered a remarkable achievement, yet the Malayan natives have used exactly the same principle in making matches for centuries. On a lathe composed of two tough thorns they mount a piece of buffalo horn, with a bow string around it. One man saws away on the bow, revolving the horn, while another turns out a small cylinder, about three inches long and an inch in diameter. In the cylinder they drill a tapering hole, a quarter of an inch across at the end and slightly less near the bottom, and then turn out a piston an inch and a half long, slightly larger than the bottom of the cylinder hole, and with a button of horn as big as the cylinder on one end. Around the piston end they wrap some thread, greased, to form a piston ring, and cup the end of the piston slightly to hold a pinch of vegetable fiber. The piston with its fiber is inserted a short way into the cylinder, which is held tightly in one hand. Then the other palm is brought down with considerable force on the horn button, driving the piston in so sharply that the highly and rapidly compressed air becomes so hot it ignites the tinder. The first and middle fingers grasp the horn button at the end of the stroke and jerk the piston out, so that the fire can be kept alive by blowing on it.

Native clothing is worn in the jungle even by the white engineers, except when on actual survey work. The native dress is chiefly a sarong, which means envelope. It is like a sack or tube, about four feet long and as wide, with the bottom left open. Slipped over the head and under the arms, the surplus is held out to one side while a finger is inserted between the folds and run around to the back, then is quickly withdrawn and the fold caught there, the rest of the cloth being tucked in at the top in front.

The women, being Mohammedans, wear a veil when abroad, and for dress wear a short jacket is sometimes added. The sarongs are made of beautifully colored silk.

Even the Foxes Fly in Topsy-Turvy Land; This One Is Notable for Its Immense Wingspread

TANK SHIP WITH DOUBLE HULL KEEPS CARGO HOT

To keep asphalt warm while being shipped, a California oil company has designed a double-hulled tanker with steam coils in the intervening space. An even distribution of heat is thus assured, preventing the asphalt from solidifying.

Courtesy The Sphere

In Memory of a Great Polish Leader, Thaddeus Kosciusko; This Earthen Mound Is One of the Sights of the City of Cracow and Has Been Built in the Midst of a Series of Forts

EARTH MOUND IN POLISH CITY HONORS KOSCIUSKO

One of the unique modern monuments of the world is that in the city of Cracow, in honor of the great Polish hero, Thaddeus Kosciusko. It takes the form of a large conical earthen mound, rising from the center of a group of fortifications. A pathway leads to the top where a clear view of the city may be enjoyed.

HUNT ELEPHANTS IN AMERICA FOR FOSSIL COLLECTION

A hunt for remains of mammoths that inhabited this country thousands of years ago, has been conducted in Florida and Oklahoma by Dr. James W. Gidley, of the National museum. An object of the search is that a complete skeleton may be obtained for mounting. The base of a skull, some teeth, ribs and foot bones were found near Alva, Okla., with fossils of parts of other animals including the three-toed horse and a deerlike creature. In Florida, better-preserved relics are hoped for, as the fossil bones are buried deeper. The mammoth passed out of existence in the glacial period; before that it roamed widely over the continent. It was probably twice the bulk of the present elephant and was a "cousin" of the mastodon.

FRUIT-JAR CAP STRAIGHTENER REDUCES SPOILAGE

Needless expense in buying new fruit-jar caps by reclaiming the old ones, and greater assurance that the contents of the jars will not spoil, are offered in a simple unit for truing the edges of the caps. It consists of a roller that fits in the grooves of the cover and a crank to turn the cap, which is fitted to a holder. A lever is furnished to press the roller tightly against the edge and "iron" out any irregularities that may have been formed.

¶Sugar beets furnish about one-half of the world's supply of sugar.

EIGHT CENTS TO TON OF SAND IS YIELD OF GOLD MINE

A yield of but eight cents to the ton of sand and gravel would not tempt the poorest placer miner, but that is all the yellow wealth obtained from a big California working, where $50,000,000 worth of gold has been extracted in twenty-three years. The explanation lies in modern machinery and enlightened engineering. Huge dredges are employed to sift the sand, enough electricity to supply a city of 60,000 persons is required and 200 men are employed. In twenty-four hours, 100,000 tons of material are handled and during the twenty-three years of operation, the company has moved about 135,000,000 more cubic yards of earth than was excavated to dig the Panama canal.

Testing Horse's Eyes for Defective Vision; Most of Their Optical Ills Are Said to Be the Result of Heredity

TESTER FOR HORSES' EYESIGHT TO CURB DISEASE

Defective vision in the mounts causes more than ninety per cent of the accidents during horse races, jumps or riding, according to a specialist. He has devised an instrument for testing and recording the vision of the horse, to detect the presence of ailments. Practically all eye trouble in horses is due to hereditary causes, according to this authority.

CURSE OF DEAFNESS RELIEVED BY HEARING LEAGUES

Surveys made by the leagues for the hard of hearing in various American cities indicate that there are 3,000,000 children with defective hearing in this country, but that eighty per cent of deafness could have been prevented if recognized early enough and given proper care. Under the direction of the leagues and with the co-operation of school boards, thousands of pupils are given hearing tests by competent ear specialists with accurate instruments; lip-reading classes are held for the deaf, and vocational departments maintained for securing proper employment for those with defective hearing.

FACE MASK FOR LIBRARIANS SHIELDS THEM FROM DUST

Keeping the thousands of volumes in the New York public library in repair is a task requiring special workers so that the books will always be in condition for loaning. To protect themselves from dust and germs, a tape mask that guards the face and mouth has been used by some of the repairers. It is especially useful when examining volumes that have been in storage some time.

Librarians Wearing Dust and Germ Masks

Parachute in Container; It Is Pulled Out When Pilot Leaps over Side, Saving Bother with Release Cord

PARACHUTE IS CARRIED IN TUBE TO INSURE OPENING

Successful tests are reported with a parachute incased in a metal tube, which protrudes through the cockpit floor of the airplane. When the aviator jumps, his weight snaps it out of the carrier by means of a cable attached to the parachute and the flyer's back. This insures quick opening and forestalls any chance of the aviator not being able to pull the release cord.

HOW CHINA'S WAR AFFECTS U. S. SEEN IN PAINT MARKET

At first thought, a war in China and the price of varnish seem to have no connection but the relationship is direct, for most of the wood oil, extensively used in paints and varnishes of various kinds, is obtained from China. The recent military troubles there have sent the price from twelve to thirty cents a pound. We import more than 12,000,000 gallons yearly. Ten years or so from now, this country may not be so dependent on China for the material, because plant explorers of the department of agriculture have introduced a tung-oil tree here. In a few seasons, Florida, Georgia, Mississippi and Louisiana will be producing the oil, but the trees are only saplings now.

FABRIC THAT RESEMBLES STONE MAKES HANDSOME WALL

Imitation Italian travertine is now furnished in a fabric wall covering that is easily applied and is said to closely resemble the natural material. It is impervious to water and can be washed with soap if it becomes soiled. Different colors are provided and a nonrepeating block design is followed in the pattern to increase the effectiveness of the material for interior decorating. It is easily repaired if damaged and may be removed whole for use on another wall.

MOTORBIKE HAS AN INCLOSED PASSAGE COMPARTMENT

Many of the conveniences found in a touring car have been fitted to a motorcycle and sidecar a Chicago man has designed. The cycle has reverse gear, a horn and whistle for warning signals, and the passenger compartment is equipped with a top, a seat that can be adjusted for sleeping, a footrest, windows on the driver's side, permitting conversation, and a light for reading. In all, the vehicle has twelve lamps. The sidecar is waterproof and the fender is removable for entrance to the compartment. The outfit is adapted to long trips at lower than auto costs.

How Sides of Motorcycle Passenger Car Fold Out for Convenience of Occupant and for Loads

Thomas A. Edison with One of His First Phonographs, Which Will Be Fifty Years Old on August 12, and One of His Dictating Machines, Which Grew Out of the Original Invention

Edison's Greatest Invention Half Century Old

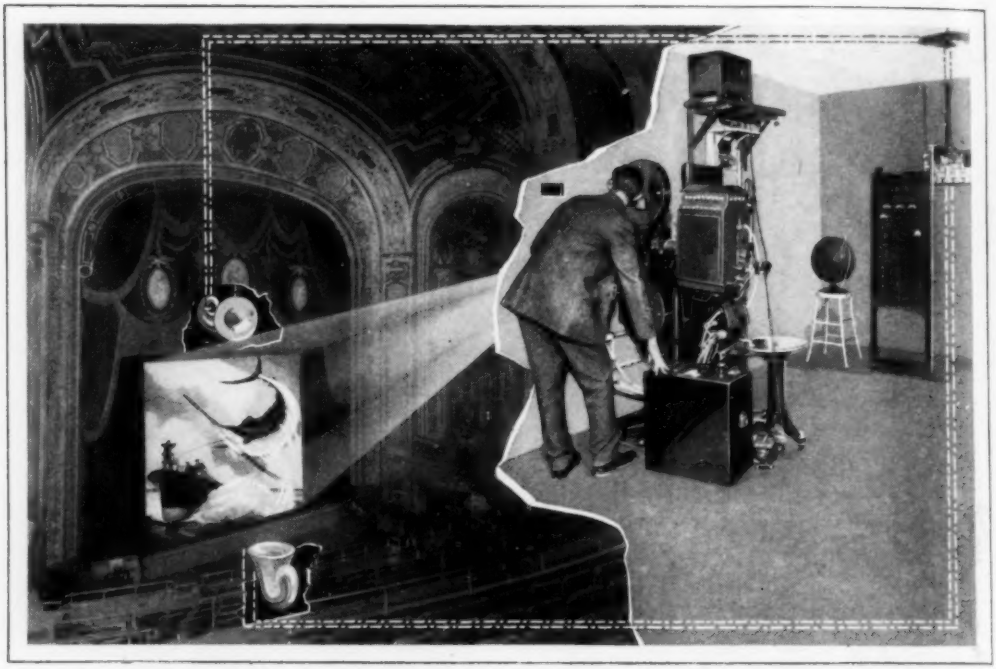
Inventor, Now Eighty, Picks Phonograph as Contribution He Hopes History Will Remember Him By

FIFTY years ago, on Aug. 12, 1877, Thomas Edison scrawled four crude little diagrams on a scrap of paper, wrote across the bottom the laconic message, "Kreusi, Make this. Edison," added the date, and—the phonograph was born!

Almost half a century later, on his eightieth birthday, the greatest inventor the world has probably ever known picked up a scrap of paper on which a reporter had written, "By what would you prefer to be remembered?" and, with the same laconical briefness, wrote beneath the question two words—"The phonograph."

The reason why the man who conceived the carbon-filament light, created central-station generating systems, invented the non-acid storage battery, brought out multiplex telegraphy and gave a host of other inventions to the world, should pick the phonograph, whose greatest development has been in the field of entertainment, as his premier achievement is twofold. First, he believes the surface of its sphere of usefulness has hardly been scratched. Secondly, as probably the most impelling reason, the phonograph was not a discovery but a true invention. No man had ever conceived recording the human voice for mechanical reproduction.

Curiously enough, Edison did not set out to invent "frozen speech and music," but was trying to perfect a telegraph repeater to record incoming messages and later repeat them mechanically to another station. Having started in life as a telegraph operator, his first interests were in that field, and the phonograph was more



One of the Latest Phonograph Applications, the Talking Movies in Which the Large Record, Shown on a Metal Stand, Furnishes Voice and Music Synchronized with the Film

or less of an accident. The repeater with which he was experimenting bore a remarkable resemblance to the modern disk phonograph. In his notebook for that day he wrote:

"Just tried experiment with diaphragm having an embossing point and held against paraffin paper moving rapidly. The speaking vibrations are indented nicely and there's no doubt that I shall be able to store up and reproduce automatically at any future time the human voice perfectly."

The telegraph repeater was forgotten. In his mind he could see exactly how a phonograph should look. The only question was the best material to use. Paraffin was too soft; the record wore out too quickly. A hard wax would have been ideal, but would require months of research, and he wanted immediate action. Tinfoil suggested itself—something soft and pliable, yet more durable than coated paper. On Aug. 12, the rough diagram was drawn, with a note to John Kreusi, his instrument maker, to "make this." The mechanic also was told he could spend up to $18 on the model!

The model was completed within a few days and carried to the "old man," as the thirty-year-old inventor was even then called. The laboratory staff, curious to see the outcome of what Kreusi had freely branded as a "crazy idea," gathered around. Edison turned the crank to test its friction, wrapped a sheet of tinfoil on the cylinder, fastening the ends down with a strip of lead, laid in a groove cut for the purpose, and adjusted the mouthpiece.

He grasped the crank, for the first phonograph was hand-operated, and began to turn, at the same time shouting into the mouthpiece:

"Mary had a little lamb,
Its fleece was white as snow,
And everywhere that Mary went
The lamb was sure to go."

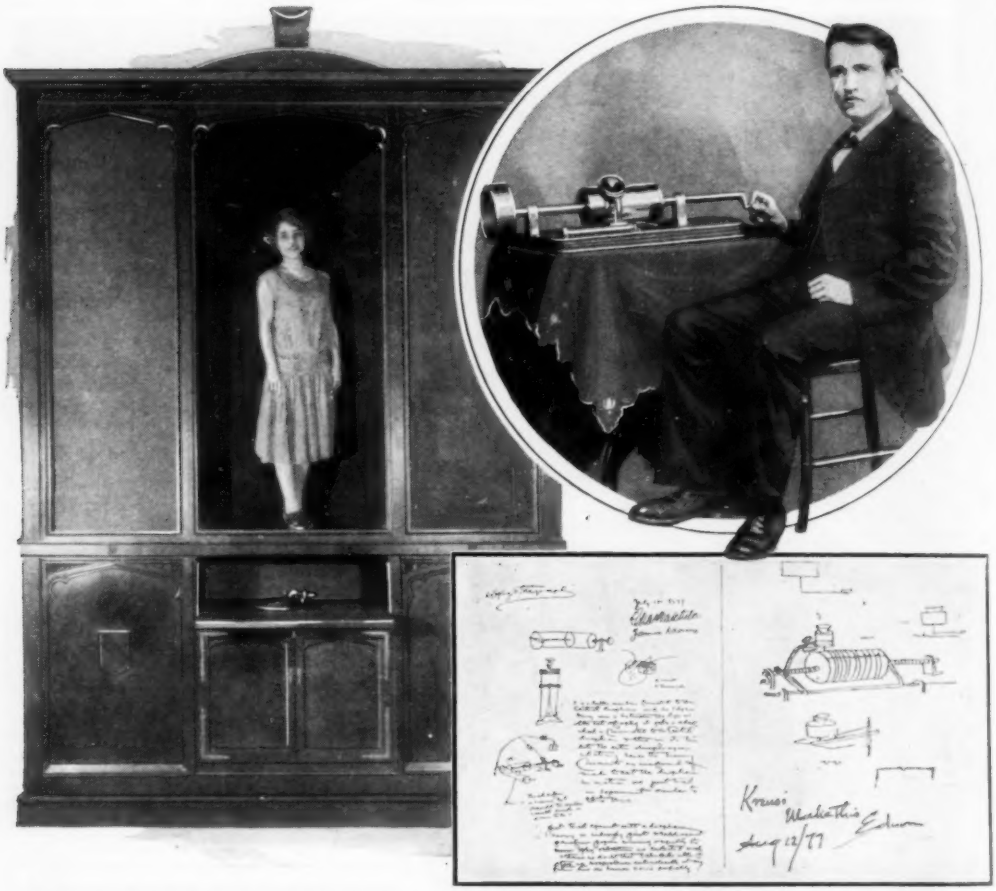
The laboratory wits were convulsed with laughter at the picture of Edison shouting childhood rimes at a revolving piece of tinfoil. Amid their shouts and jokes, Edison calmly substituted the reproducing diaphragm, turned the cylinder back to the starting point, and spun the crank. Back from the tinfoil, in a high, thin voice came the words:

"Mary had a little lamb...."

Straight on to the end it went, not a word missing!

Edison Invented Both the Phonograph and the Movies, and Now They Are Combined; Above Is an Orchestra Recording in the Old Mechanical Days When They Had to Be Grouped Closely around the Horn; at Right, a Record Maker Is Watching the Disk as It Is Engraved with Sounds

Modern Radio Microphones Have Eliminated Close Grouping and Carry the Sounds to the Recording Laboratory; Here Is a Set Used to Photograph the Singer in Action While the Record Is Being Made



The Horn of the New Victrola for Auditoriums Is So Big a Girl Can Stand in Its Mouth; at Top Is Young Edison with His First Phonograph, and Below It His Original Dated Sketches

It was a memorable day, and night, too, at Menlo Park. Nobody went home. Hour after hour they stood around the machine, taking turns at speaking, laughing, whistling and singing, and then listening to their voices repeated back to them.

The next day Edison carried the first phonograph under his arm to New York and demonstrated it in the office of a friend. The demonstration was a success, and the papers were filled with reports which were cabled all over the world. Orders poured in from every quarter, and Edison, without stopping to perfect and improve, was forced to begin making machines immediately, to supply the demand. The phonographs were used for exhibition purposes. So great was the interest aroused, that one enterprising exhibitor cleared $1,800 in a single week in Boston.

The craze lasted for a year and a half, then gradually died out. Edison had become interested in the electric light, and for nine years let the phonograph languish. Yet he realized its possibilities and, in an article published a few months after the invention, he listed no less than ten fields of development in which it would prove a boon to mankind.

It wasn't until 1887, ten years after the original invention, that he went back to the phonograph. His first step was to revolutionize the machine, substitute a permanent cylindrical wax record for tinfoil, and a battery-driven electrical motor, which was very shortly replaced by a spring motor.

Until radio came along to challenge its supremacy, the phonograph held the center of the stage as a music and speech re-

producer. Radio made a temporary dent in its prestige, but the various manufacturers, who saw their profits threatened, responded with a series of notable inventions that again revolutionized the canned-music art.

The company which had been founded to develop Berliner's disk inventions produced, in co-operation with the Bell telephone laboratories, an entirely new type of reproducing horn. About the same time radio and the phonograph were combined, using radio tubes and electrical power to pick up and amplify the vibrations of the needle traveling over the record.

Two other notable inventions involving phonographic records quickly followed. The first was the perfection of talking motion pictures, utilizing large phonograph records and radio amplifiers to furnish the sound. Talking pictures were not new. Lee DeForest had brought them out several years before, with the sound photographed on the edge of the film.

The new idea involved using an ordinary phonograph record which should be recorded in perfect synchronization with the movie film, and the projection of the film and the reproduction of the sounds in perfect tune, which is achieved by operating both from the same electric motor, so their speed in relation to each other cannot vary.

The latest application of Edison's original phonograph principle is in the recording of motion pictures on wax disks, from which they can later be reproduced by playing the record on the phonograph. The idea is the invention of an English experimenter with television. The movie scenes are picked up, not by the usual camera, but by a photoelectric cell, which records them as pulsating electric currents, that in turn operate the cutting tool making the record. When the record is played, the reproducing needle is used to create another pulsating current, which operates a neon light to sweep bands of light and dark across the screen, creating the pictures again.

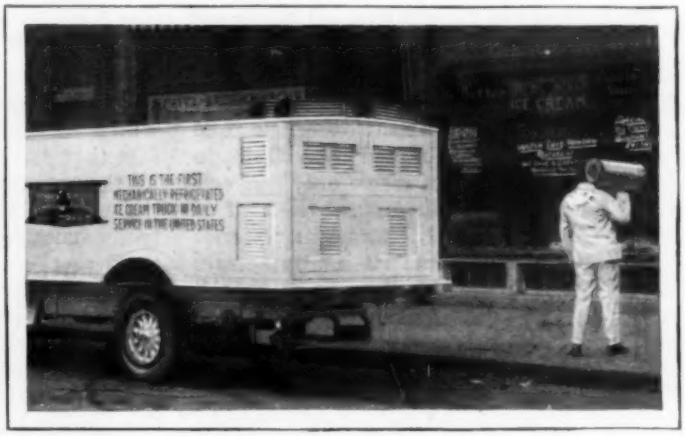
John Sheepers, Right, Receiving Medal for Prize-Winning Tulip from Secretary Jardine

NEW TULIP WINS GOLD MEDAL AT FLOWER SHOW

A tulip was judged the best of the new flowers shown at a recent New York floral exhibition and was awarded a gold medal by Secretary of Agriculture Jardine. It is named the "Miss Helen Eakin."

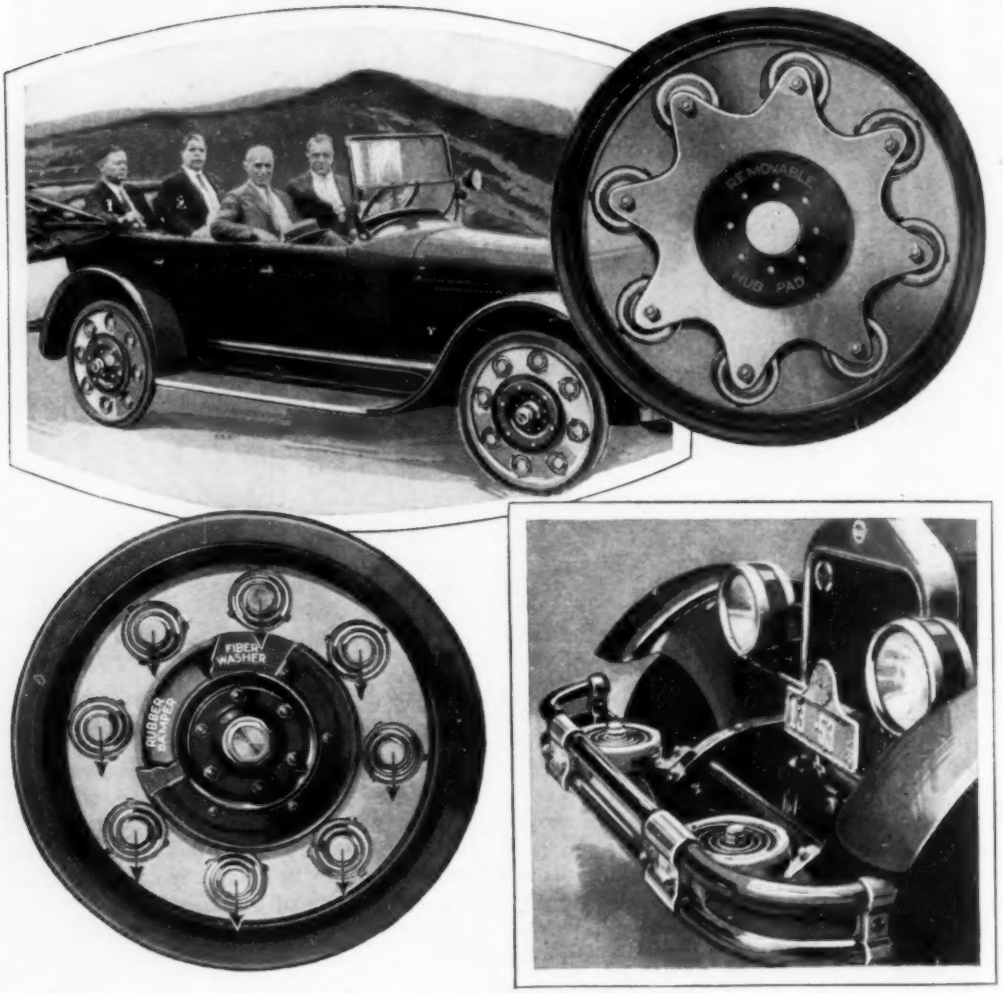
THIS TRUCK MAKES OWN ICE FOR DELIVERING CREAM

For ice-cream storage and delivery, an auto truck now on the market is equipped with an electric refrigerating plant instead of ice. Temperatures of several degrees below zero can be attained, while the coils and other parts of the apparatus are compactly arranged and save transporting hundreds of pounds of ice, brine, tanks, etc.



Ice-Cream Delivery Truck with Own Refrigerating Plant

SPRING WHEEL TO END AUTOISTS' TIRE TROUBLES



Car Equipped with Spring Wheels, and Another with Spring Bumper; the Inserts Show, Top, the "Spider" Which Distributes the Load to the Springs, and, Bottom, the Outer Side

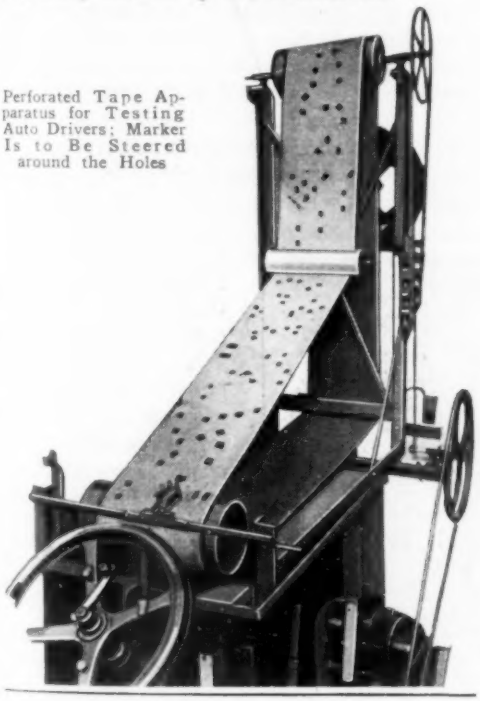
A spring wheel which permits use of hard-rubber tires even at speeds of seventy miles an hour without excessive road shocks has been developed by a Chicago inventor, who believes it not only will end tire-repair troubles, but reduce the cost of tires through longer life and less material and labor consumed in manufacture. Called by the maker the "resilient wheel," it employs eight flat spiral springs to support the load, the center of each spring being attached to an arm of a cast-metal "spider" which revolves about the hub, where it is cushioned by a heavy rubber pad built into the wheel. Because of its peculiar construction, the wheel produces an entirely new effect—the load revolving while the wheel rolls forward, due to the fact that the load is carried near the rim, by the springs, instead of in the center of the wheel. Ordinary wheels, unless perfectly balanced, produce increasing vibrations as the speed increases. The spring wheel, however, when it reaches its critical high speed, actually carries the load at a higher point than at low speed, for the springs have a tendency to establish a common center, in doing which they lift the load, and thereby overcome gravity. A similar bumper is also being made.

CABLE LINES TO CARRY MAILS IN PLACE OF AIRPLANES

As a substitute for airplanes in carrying mails, an eastern engineer has suggested the use of long, slim containers, moving at high speed on an overhead cable suspended between high towers. They would be driven by motors or propellers and might be operated either with or without a pilot. It is estimated that this method would be more economical, faster and less hazardous as well as more regular.

TEST DRIVERS' STEERING SKILL WITH PERFORATED TAPE

Candidates for automobile drivers' licenses are given numerous tests in Germany, one of them being a trial to determine how skillful they are at steering. A perforated tape is rotated past a marker attached to an automobile steering wheel. The objective of the subject taking the test is to avoid striking the perforations which represent obstacles in an actual road. Turning with the wheel, as the tape passes, the marker leaves an actual record of the candidate's solution of the obstacle problem. A rating is given on the basis of the accuracy shown by the candidates.



Perforated Tape Apparatus for Testing Auto Drivers; Marker Is to Be Steered around the Holes

Making Up with the Help of an Air Brush; Applying Whitening to Hide Sunburn on Actress' Arms

AIR BRUSH IN MAKE-UP SOLVES MOVIE PROBLEM

Extensive alterations in costumes sometimes have to be made in the motion-picture studios to hide the effects of sunburn. This will no longer be necessary, in the opinion of an inventor who has prepared a flesh-tint spray which is applied to the skin with a compressed-air outfit. An even coating is easily administered and the material is said to cover the darkest shade of burn effectively.

FOSSILS FOUND IN RIVER BED

It will be necessary to change the course of the Kansas river, at Topeka, to uncover a bed of fossil remains believed to underlie the water, in the opinion of engineers. Three huge fossil teeth have been dredged up by sand companies, two of mastodons and one of a mammoth. Each of the mastodon teeth weighed ten pounds, was seven inches long, four inches wide and three inches high. Other fossil bones have been recovered from time to time.

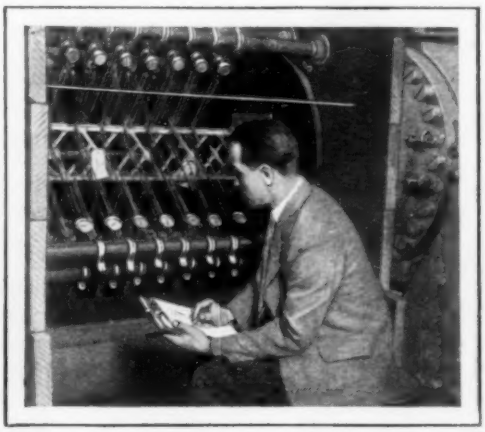
Pondering the Problem of Using Sound Waves to Treat Illness; Inventor with Radio Apparatus Used in Tests

HARNESS MUSIC SOUND WAVES TO RELIEVE ILLNESS

Instruments to utilize more effectively the healing power of music have been designed by a concert pianist and a scientific investigator. With their apparatus, the long or audio waves are imposed on rays that penetrate the body, resulting in vibrations which are said to be of great benefit in relieving nervousness, depression and other ills.

STRENGTH OF AIRSHIP GIRDER TESTED BY SQUEEZING

How much strain can an airship girder stand? The question is important in building big dirigibles, for costly experience has shown that the duralumin units are sometimes subjected to stresses beyond their strength and disaster follows. Investigators at the bureau of standards have a special apparatus by which the parts are given rigid tests, while observers record the performance. The part to be examined is placed in front of a powerful plunger which slowly presses against it, while as many as eighty-five micrometers, connected to the girder, register the slightest reaction to the strain. The test gives a good indication as to how the part would perform in actual service.



Reading Gauges That Tell Where Duralumin Girder Is Weakening; Piece Being Squeezed by Big Plunger

ROCK FOUND IN BED LEADS TO BETTER SPARK PLUGS

Because a prospector who was sleeping outdoors in the mountains of Mono county, Calif., felt a stony lump in his bed, our spark plugs are now better than they used to be. The chance occurrence disclosed to Dr. Joseph A. Jeffery, of Detroit, the only known deposit of sillimanite in the world. During the war, the government felt the need of better spark plugs. A porcelain core was desired that was stronger, that had a higher electrical resistance at high temperatures and a greater heat conductivity. Certain spark plugs exhibiting these desirable characteristics were tested and it was found they were better because the cores were composed of sillimanite crystals. However, such great heat was required to produce this sillimanite artificially that it looked doubtful as a commercial venture. Then a search began for a supply of sillimanite that had been produced in nature's own laboratory. Some specimens were traced to South Dakota, and Dr. Jeffery began his geological "detective work" by prospecting there. Again, the sub-

Courtesy The Pullman Company

Dining Room in the Mexican Presidential Train of Five Cars Recently Built in America; There Are Seats for Fourteen Persons; Special Silverware Was Made for the Car

stance was found only in scattered crystals, located as small pockets in other rocks. His next search was based on a "hunch." If there was any sillimanite, he reasoned, it would be found in regions where great natural convulsions had taken place. He decided that the Inyo mountains in California had come through about the greatest volcanic disturbances. Two prospecting trips in this range merely yielded more of those exasperating little specimens. On the third trip came the episode of the rock in the bed which proved to be sillimanite. Being on a rocky shelf, the chunk must have fallen there from higher up, Dr. Jeffery reasoned. Behind the prospectors loomed a perpendicular cliff 14,250 feet high. One section of this cliff seemed to be more blue than the rest of it. Investigation revealed a deposit of several million tons of the ore.

TRAIN FOR MEXICAN PRESIDENT HAS MANY LUXURIES

One of the most luxurious trains ever produced was built recently for President Calles of the Republic of Mexico. It cost more than $500,000 and consists of five steel cars, one for the president's personal use, a dining and smoking car, staff car, escort's car and a special automobile car with space for four machines. The interior decorations and furnishings reflect details representative of Mexican art from Aztec days to the present time, and were chosen to harmonize with the furnishings in the president's palace in Mexico City. Fourteen persons can be seated about the two telescoping walnut tables in the dining car.

¶ Sound and images have been transmitted on the same radio wavelength.

Where the WEST

Little Eagle, One of the Indian Riders on Miller Brothers' Ranch

ON the "101 Ranch," near Ponca City, Okla., the largest food-producing establishment of its kind in the world, you can ride in a few moments from the progressive present to the scenes of the remote pioneering period, for this 110,000-acre project, in addition to fostering modern scientific farming, also preserves the practices and traditions of cowboy days.

Superlatives are drained of their descriptive resources when one visits and attempts to tell about this last of the huge ranches which once speckled western America's map. In all creation, from one end of the earth to another, a counterpart of this vast empire of stock raising, crop growing, fruit production and specialized farming cannot be found.

The largest herd of purebred Duroc Jersey hogs in the world, the biggest herds of registered Holstein and Shorthorn cattle in America, the most extensive band of buffalo under private ownership, the only herd of "cattalo," a new breed of drouth-resisting cattle, one of the largest apple orchards west of the Mississippi, new types and varieties of corn, barley-rye, pecans, peaches, plums, apples, grapes and other fruits—these are but a few of the various outstanding accomplishments of this Oklahoma ranch.

Col. George W. Miller, a native Kentuckian, deserted the Bluegrass country in 1872 in order to seek a stock-farming fortune in the primitive southwest. Eventually he settled in Oklahoma and leased grazing land from the government for from two to five cents an acre. In the course of time, he became friendly with the Cherokee, Ponca and Otoe Indians, and from then to now, the Millers have annually rented large tracts of grazing land from the redskins. At one time, Col. Miller rented 250,000 acres of Indian land.

When Col. Miller died twenty-four years ago, the ranch covered 110,000 acres, one-half of the property being owned by the Millers. His three sons have managed the

is Still WILD

An Old-Fashioned "Chuck-Wagon" Still in Use, and a Group of Cowboys Out on a Cattle Roundup on the Vast Miller Range, Where the Old West Is Kept Alive

ranch during recent years, and, fulfilling their father's wishes, have developed it into the finest farming enterprise of its kind. Some years ago, oil was discovered on the property and at present more than 150 wells are in operation, yielding from $20,000 to $25,000 in oil daily.

The Miller ranch since its inception has been a training school for cowboys and cowgirls. A rodeo and roundup, one of the big events of the cowpunchers' calendar, is held annually at this ranch which attracts thousands of visitors from all parts of the country and which ranks in the same class with the famous frontier entertainments that take place at Cheyenne and Pendleton.

Three thousand of the best breeding Duroc Jersey swine which money can buy compose the champion hog herd which specializes in the production of valuable parent stock for new stock. In addition, more than 15,000 hogs as well as 20,000 Texas cattle are fattened annually and butchered in the large packing plant which is an important part of the equipment.

The herd of 500 Holstein cows is without equal from the Atlantic to the Pacific, butter and ice cream being the dairy products which are sold, while the skim milk is fed to the hogs. The cows are milked by electricity and the dairy is provided with the most modern labor-saving machinery.

A breeding herd of 2,000 registered Herefords and 3,000 purebred Shorthorns is providing foundation stock which is doing much to improve the cattle of the southwestern states.

The 160-acre apple orchard is the largest in Oklahoma, and last year produced 40,000 bushels of top-quality fruit, all of which was sold directly through the large store on the ranch. Peaches, plums, cherries and other fruits also are produced on an extensive scale.

It is not uncommon for the Miller wheat crop to aggregate 100,000 bushels, the elevators at the ranch being large enough to accommodate the maximum crop of bread grain which can be raised. Ten thousand acres of corn provide feed for the enormous herds and flocks and produce a marketable surplus. Last year, 90,000 bushels of fine seed corn were distributed throughout the southwest. This

Jack Miller and Some of the Purebreds That Have Replaced the Old-Time Longhorns on the Plains, and, at Right, Chief Sheet Lightning, One of the Indians of the Ranch Circus

corn was originated by the Millers and is a cross of a white corn on the speckled squaw corn of Oklahoma. It is in demand because of its ability to withstand dry weather.

But sentiment is not forgotten on this agricultural empire. A herd of 300 breeding buffalo roams a large well-grassed pasture. It is a heaven and haven for buffalo multiplication. For many years the Miller boys besought Uncle Sam to protect the remnant bison from extinction. The government took no action and finally the Millers established a buffalo preserve of their own where they have provided ideal conditions for the band of bison to live and increase. The surplus buffalo are used for educational and exhibition purposes, and are sold to zoological gardens, public parks, museums, sideshows and circuses.

Scientific farming is in profitable partnership with practical agriculture in Kay, Noble and Pawnee counties, Oklahoma, where the 200 miles of Miller fences are stretched. These sons of the cow country, who possess sheepskins from prominent colleges, have hired science to solve some of their riddles. As a result they have developed a combination barley-rye which provides the best of winter pasturage. They have produced a new breed of beefsteak makers by crossing buffalo with ordinary range cows. A herd of 300 of these animals, called "cattalo," is now main-

Two of the Hundred Cowboys Gathered by the Millers to Work Their Ranch and Keep the Old West Alive by Carrying on the Work Started by Col. William (Buffalo Bill) Cody

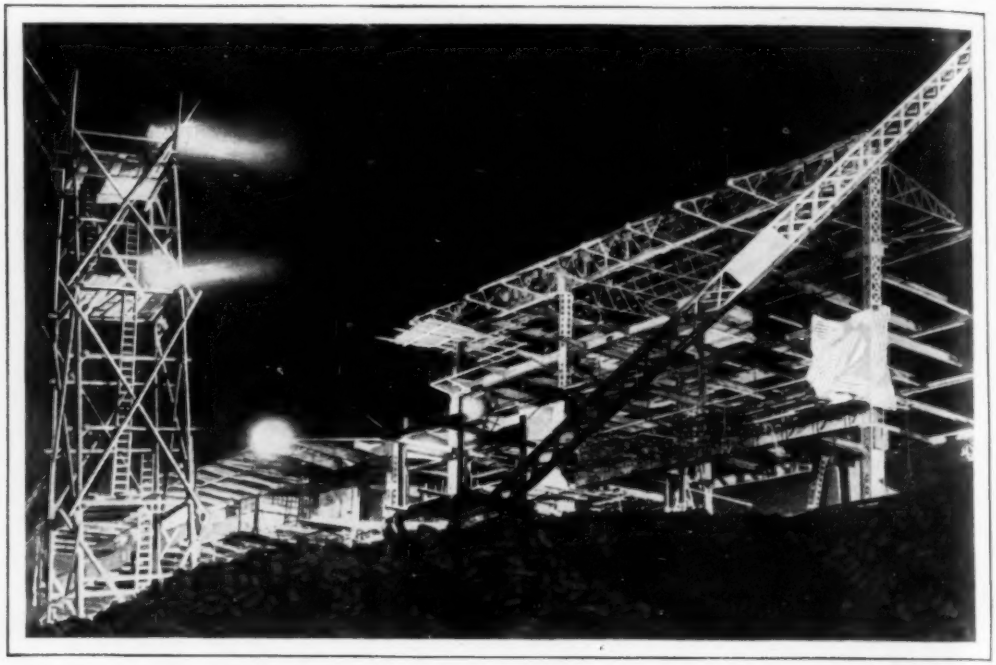
tained at the ranch. They have also been successful in crossing the Big Brahma, the sacred cattle of India, with Oklahoma cows, thus producing the most drouth-resistant cattle known.

Skill with grafting tools and proficiency in horticultural art have enabled them to graft a Japanese persimmon on the Oklahoma native, the paper-shelled pecan on the Oklahoma variety and finer-quality peaches, plums, grapes and apples on the local varieties. Similar scientific skill has been harnessed to improve the native vegetables and truck crops.

From the covered grandstand, which seats 20,000 spectators, to the special oil refinery, huge blacksmith shop and marble-columned mansion, the ranch is as interesting as a six-ring circus. A 200-horsepower electric engine, which runs by natural gas, is used in making all the lubricating oil for the fleets of trucks, tractors, gasoline engines and automobiles. Machine power has replaced handwork wherever possible on this huge establishment. It is one farm, at least, which operates on a factory scheme and scale.

ARTIFICIAL LEATHER IS MADE FROM SCRAPS

Leather waste, or scraps, is now being shredded and prepared into a paste which is rolled into sheets. To the paste, is added fibrous substances such as hemp, flax, jute, wood and cementing material such as animal or vegetable glue. The product is usually dyed and, as it is easily ornamented or embossed, is especially suited for wall coverings and upholstery.



Night Work on the Grandstand Built at Epsom Downs for the Great Derby; Construction Went On after Nightfall with the Aid of Huge Electric Searchlights

LAMPS TURN NIGHT INTO DAY TO FINISH STEEL JOB

Workers staged a race against time in completing the huge grandstand for the annual Derby at Epsom Downs, England. Much of the steel construction was done after nightfall with the aid of powerful electric searchlights, focused to spread their rays over a wide area. The men were kept busy day and night to finish on time.

AUTO SHIMMYING IS STOPPED BY FRICTION PLATES

To keep the front wheels of the auto from wabbling, a simple unit fastened on the spindle-arm bolt and locked to the tie-rod yoke, is said to be effective. It operates by friction developed between the drum part of the device and the band attached to the spindle arm. It is said not to interfere with driving of the car or to make steering hard and is self-adjusting, as the friction band is designed to take up the wear as developed. Only one is needed to a car.

MOVIE MAKERS DEFY WEATHER ON INDOOR STAGES

Outdoor movie scenes are now being largely filmed on stages, to avoid costly delays due to weather uncertainties. A few months ago, one company delayed production on a winter picture so long that spring melted all the snow, and the entire picture was taken indoors using artificial snow—a combination of gypsum, salt, flour and untoasted cornflakes. Another company constructed a section of the African veldt with spectacular cloud effects which would have necessitated waiting for weeks to get its duplication in nature on a location trip. The roof of a skyscraper was built indoors in another instance. This set had three distinct parts which were combined into one on the motion-picture film. First there was the backdrop with a city painted thereon. Then the actual set. Then this was shot through glass, the upper part of which was masked

off with black paint so that it hid the top of the stage, where the lights came from, and gave the impression of a dark night with plenty of sky. For a day scene, the black mask was painted over with fleecy clouds. In the case of snow-country pictures, the custom now is to take a short location trip to film long shots and then return to the studio and film all the action in medium shots and close-ups.

FUMELESS HORSERADISH GRATER

Preparing horseradish "without shedding tears" is now possible with a power-driven grater that removes the fumes before they can spread. This is accomplished by the centrifugal force of the rapidly revolving cylinder that does the grating, no fan being needed. Air and odors are discharged at the rate of 150 cubic feet per minute into a pipe leading outside the building. As the horseradish is ground, it falls into a crock of vinegar, saving the trouble of scooping it from a receiving bin. The grater is made entirely of metal and is intended for preparing large quantities.

OLD STUMP AS GIANT UMBRELLA SHELTERS GARDEN SEAT

Instead of removing an old tree, which would have spoiled the appearance of his garden, a California man built a rustic seat about the base and converted the top into

Tree Umbrella Fashioned from an Old Stump for Shelter over Garden Bench

a wide shelter. The result was a natural "umbrella" of very attractive form.

Trying to Force the Plate into the Socket and Enjoying the Task; Below, Position for Two "Players"

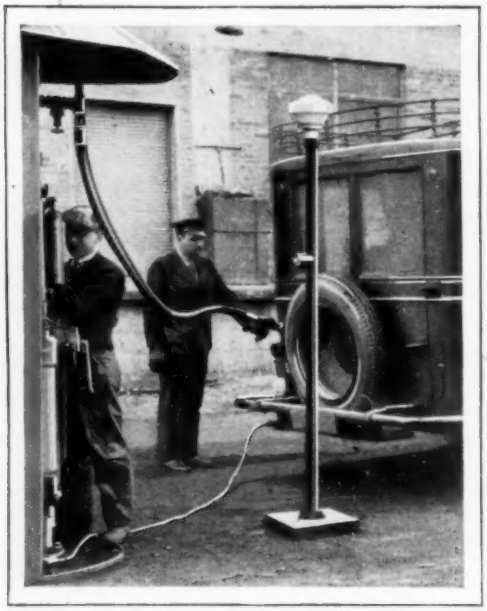
WRISTS AND ARMS DEVELOPED WITH SPRING GRIPPER

Helpful exercise for the hands, wrists and arms is afforded by a compact unit recently introduced for the home or gymnasium. It consists of a small cylinder, into the top of which a movable plate is to be forced by means of a handle. To do this, a spring must be depressed and considerable strength and steadiness are required, although the task may be made as easy as the user desires by regulating a screw at the bottom of the cylinder. The gripper, with the exception of the cover on the handle, is made of metal that will not rust, and it is intended to last a long time under constant use. Two persons can operate it at the same time, enjoying a contest and game together.

VIOLIN BOW HAS BALL BEARINGS FOR EASIER TIGHTENING

Children sometimes have difficulty in tightening the hair on violin bows, and adults often experience trouble with cello and bass bows. To eliminate this, a western inventor has introduced a bow with a ball-bearing screw. There are eleven steel balls, each one-sixteenth of an inch in diameter, to permit easy turning of the tightening unit.

DANGER IN "GASSING" MOTOR BUS REDUCED BY GROUNDING



Filling Gasoline Tank on Motor Bus in Safety; Note Cable at Bottom, Making Ground Connection

Filling the gasoline tank on automobile coaches presents a hazard under some conditions, as a spark, occurring between the nozzle of the hose and the tank, may cause a fire or explosion. To eliminate this risk, a western company has devised a means of grounding the car while the tank is being filled so that any static present is carried off. A cable is installed at the gasoline pump, grounded to a water pipe at one end and fitted with a plug at the other. Each coach has a porcelain receptacle, connected by cable to the frame and forming the ground for the entire electrical system of the coach. Before gasoline is pumped in, the operator inserts the plug into the porcelain socket, thereby grounding any static charge that may have accumulated. Where special connections are not provided, a substitute is furnished by grounding the tank to a pipe through a chain before starting to fill the tank. This plan is not so efficient as the other, but establishes a fair degree of safety.

BUTTERFLIES SAVE WALNUTS

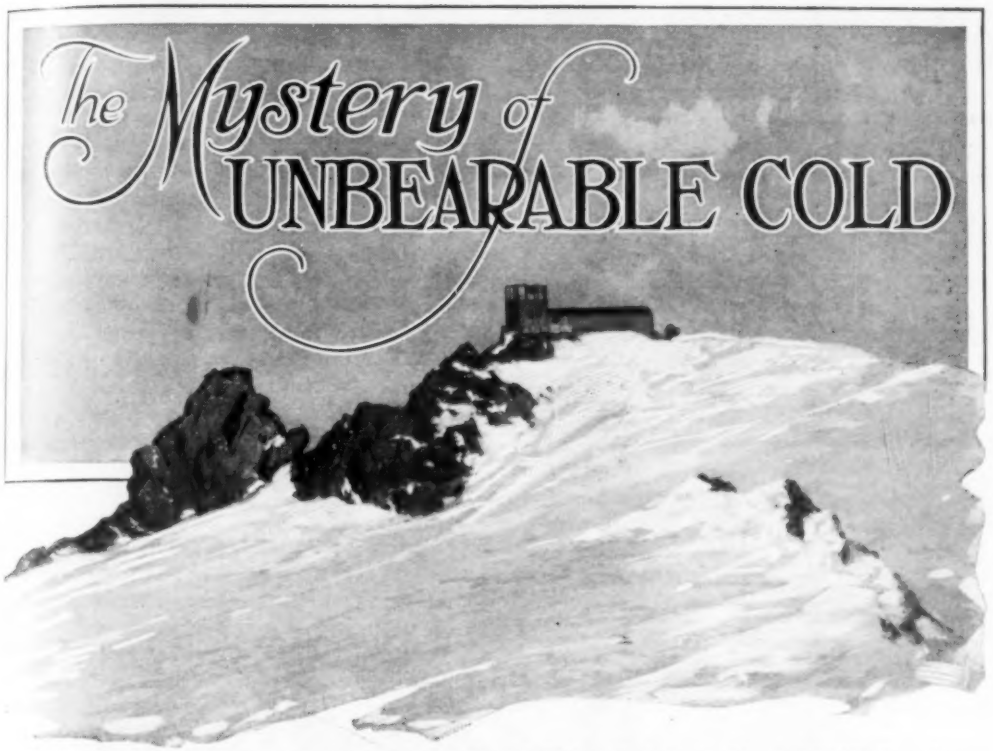
How a recent flight of the "painted lady" butterfly through southern California helped the walnut crop there, is one of the odd adjustments in nature. The insects laid numberless eggs on weeds with the result that the grubs, when hatched, became parasites that attacked the eggs of the codling moth, one of the greatest enemies of the walnut. More than fifty per cent of the moth eggs were attacked by the parasites, it was estimated, to the great benefit of the new walnut crop.

AIR TRAIN OF PLANE AND GLIDER IN SUCCESSFUL TEST

Enter the train of the air. A big plane glides over a city. In its wake, a row of gliders, connected to each other and to the "locomotive" plane by slender wires. The last glider drops away and skims gently down to a landing field. The rest proceed. The picture suggests a fanciful idea, but recent successful tests in Germany indicate that it may become a reality. The experiment was performed with one glider connected to an airplane by a wire nearly 1,000 feet long. By means of an automatic release, the pilot of the glider cut loose when ready and achieved a separate landing while the plane proceeded.

Glider Used as "Car" behind Airplane in Recent German Test; It Was Detached and Made an Independent Landing with Occupant

The Mystery of UNBEARABLE COLD



The World's Loftiest Observatory on Monte Rosa, Second Highest Peak in the Alps and 15,000 Feet above Sea Level, Where Perpetual Snow Gives Records of Extreme Cold the Year Around

WHETHER any form of life can exist at absolute zero—the point where cold reaches its ultimate limit, as it is believed to do in outer space far beyond the earth's atmosphere—may soon be known. For a scientific laboratory at Leyden, Netherlands, has recently brought cold within one degree of its final limit by solidifying a sample of helium gas received from the United States.

Absolute zero long ago was fixed by intricate calculation at 459.6 degrees below the zero on a Fahrenheit thermometer scale. No one has ever actually produced such a temperature, but the Dutch experiment came within a degree of it, which is twenty-one degrees lower than the record previously made in the United States by the liquefying of hydrogen gas.

At the farthest limit of cold, the movement of atoms which is a part of the creation of various substances ceases and strange phenomena begin to appear. The late Prof. Kamerlingh Onnes, who first reduced helium to a liquid, which occurs at about eight degrees above absolute zero, or seven degrees above the freezing point of the gas, discovered that all the accepted ideas of electrical resistance were upset there. Metals which because of their high resistance are poor conductors became excellent ones when placed in a bath of liquid helium. A ring of pure lead cooled to that temperature was used in one experiment, and after the current supply had been connected to it and a charge of electricity started traveling around the ring the wires were removed, yet the electricity kept right on going round and round the lead path as long as the ring was kept cold. For six hours the test continued, and it was estimated that, if helium had been available to maintain the temperature, the current could have been kept flowing for at least two years.

Equipment for reproducing this and other experiments through the cooling of helium to its liquid and freezing points is being installed in the low-temperature laboratory of the bureau of standards at Washington. When work gets under way, the results may revolutionize many popu-

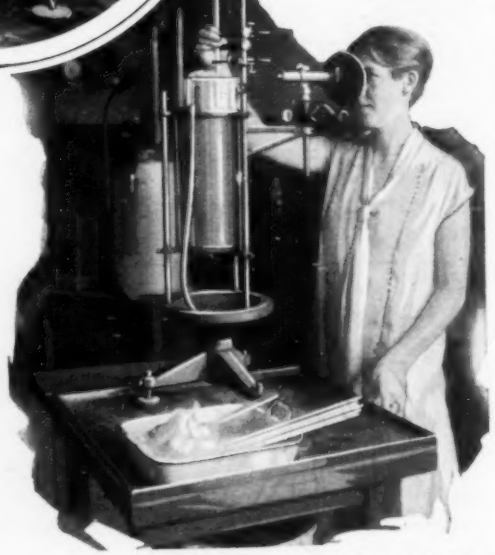
Casting a Deep-Sea Thermometer into the Depths to Get Cold Records Miles beneath the Surface, Above, and a Sounding Balloon Starting Aloft to Test the Air

lar conceptions The common idea of heat and cold as two different things has no place in science, for to the scientist there is only one unit of measurement—from absolute zero upward. Heat and cold are usually reckoned by our sense of touch rather than any scientific basis. Anything colder than blood temperature may be classed as cool, cold or colder, while anything with a higher temperature than that feels warm, warmer or hot, yet when compared to the temperatures attained in the laboratory our coldest cold is hot.

Once, in Siberia, the thermometer is reported to have gone down to ninety-two degrees below zero, and there is a record of sixty-five below zero in northern Montana. Compared with absolute zero, a mark of minus ninety-five Fahrenheit is much hotter than the difference between water at freezing and at the boiling point.

There is no reason for believing, however, according to Dr. C. W. Kanolt, of the low-temperature laboratory of the bureau of mines, that some form of life cannot exist at even the final limit in coldness. A fish, he points out, can be frozen and then revived again, provided the freezing and melting processes are carried out slowly enough not to damage the fish through abrupt changes. That being true, there is probably no obstacle to taking the frozen fish and gradually reducing its temperature to that of liquid or even frozen helium, and then as gradually bringing it back to life again. Any sudden melting, however, would blow the fish to pieces from the strains set up by the expansion.

The production of unusually low temperatures in the laboratory does not differ from the process of making artificial ice out of water, except that better equipment, more delicate care, and the utmost refinement of mate-



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Testing Thermometers in an Ice Bath to Send the Mercury Down to Zero

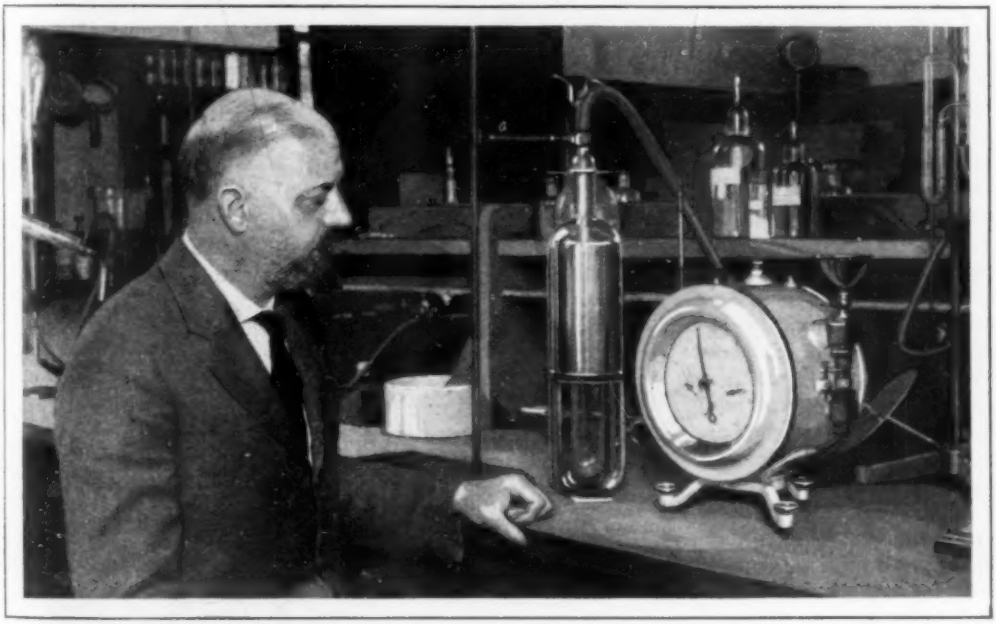
rials are necessary. A thousandth part of air in a quantity of hydrogen or helium to be liquefied would ruin the whole experiment, because air would freeze long before the gas was cooled and in freezing would clog the delicate expansion valve of the apparatus.

Like the making of artificial ice through the use of ammonia or other gases, the process is one of alternate compression with resultant heating, and expansion with the accompanying cooling. When air, or any other gas, is compressed in a confined space it contains a certain amount of heat which is distributed through the space it occupies. When the gas is suddenly allowed to expand in a much larger space, there is just so much heat to be spread through the entire space, with the result that the temperature drops enormously. In making liquid hydrogen—the coldest thing yet produced in the United States—the gas is compressed and then cooled in liquid air, which itself has a temperature so low that, if the finger touches it, the skin will be badly burned by the rush of heat from the hand to the air, just as a rush of heat from a hot iron to the hand raises a blister.

After being cooled by the liquid air to a temperature far below zero, the compressed hydrogen is allowed to expand and spread what little heat it has left over a much larger space, which further reduces its temperature by many degrees. Then a second tank of compressed hydrogen, after first being cooled by liquid air, is cooled by the liquid hydrogen, and it in turn is allowed to expand, bringing a still further drop. The process may be carried on until the gas turns to liquid at twenty-two degrees above absolute zero. The same process, carried farther, will liquefy and eventually freeze helium.

The farther the process is carried, the shorter and more difficult the steps become, until eventually the reductions are so slight that it is useless to continue—at least without better equipment and purer materials.

Liquefied gases at such low temperatures are hard to handle. If a container of liquid or solid hydrogen is left open in a room, air will rush in and freeze as it strikes the hydrogen, settling to the bottom if the gas is a liquid. As the process continues, the hydrogen rises higher and higher, floating on top of the frozen air, and more and more hydrogen is turned into its gaseous state by heat absorbed from the air.



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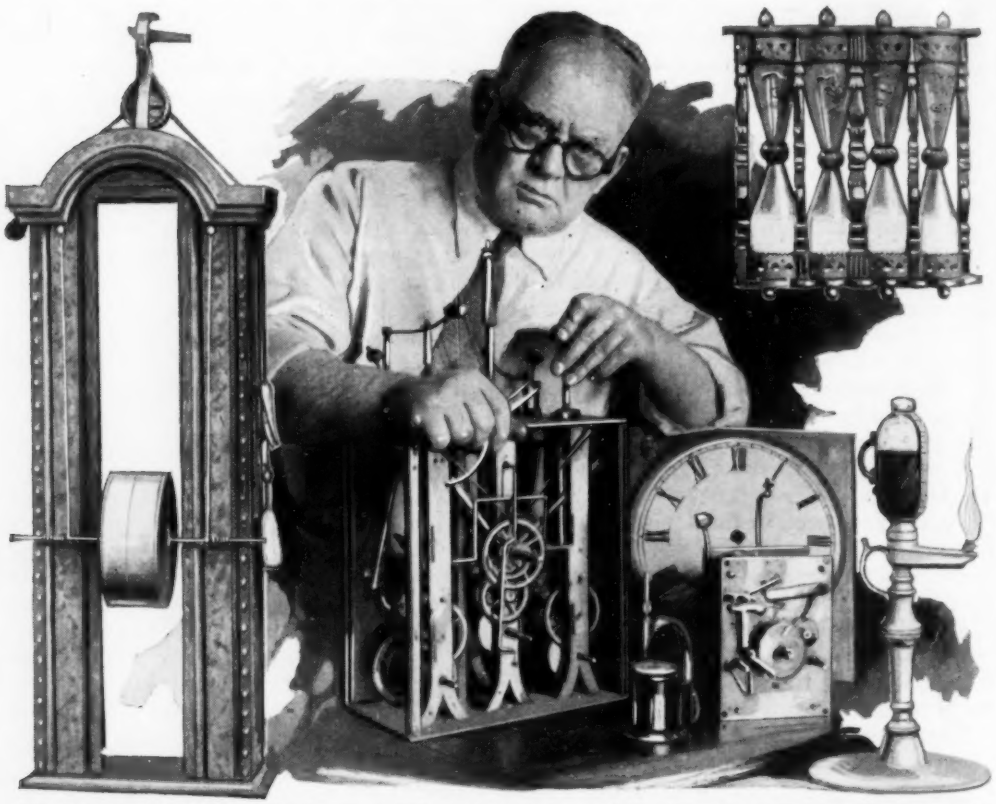
Dr. C. W. Kanolt, of the Low-Temperature Laboratory, Bureau of Mines, Who Produced the Lowest Temperature Ever Recorded in the U. S., within Twenty-Two Degrees of Absolute Zero

THIS MAN MAKES PROFESSION OF WINDING CLOCKS



Mr. Schwarz and Old-Clock Specimens; at Left, an Instrument for Measuring Time by Flow of Water; Upper Right, Sand Glass, and, below It, Roman Lamp That Told Time by Oil Level

Horace Greeley Schwarz, of Detroit, has worked up an unusual business which gives him an income that many professional men might envy. He conducts a clock-winding service for private homes. Every week, on the appointed day, he appears at a client's home, passes from room to room where there are clocks and winds and adjusts them. Schwarz has divided his territory into four routes, each serving about twenty-five customers. He charges from $60 to $96 a year for his services. The homes he serves all have staffs of servants. Why is not the butler given the responsibility of winding the clocks? The answer is that Schwarz's clients all possess antique, musical or stately grandfather clocks that they do not want to take chances with.

"People expect more of a clock and give it less attention than almost any other piece of machinery," Schwarz said when asked for tips on how to treat a clock. "In the first place, a clock should be wound regularly. If this is done, the power will be uniform and hence the timekeeping consistent. If winding is delayed past the regular period, a weaker portion of the spring is brought into play and hence the clock cannot run as accurately as it should.

"Temperature changes should be avoided as much as possible. A clock should not be placed near a hot stove or radiator one day and in a cooler spot at other times; or near a source of heat that varies as the steam is turned off or on. Clocks often stop when a room gets unusually cold and unexpectedly start, when it gets warm."

Cheap clocks that have stopped can often be "cleaned" or freed of the inside stickiness that impedes them by dipping in gasoline. Many housewives give silent clocks the "feather and kerosene can" treatment, like cure-all patent medicine. This often seems to correct the trouble. Kerosene

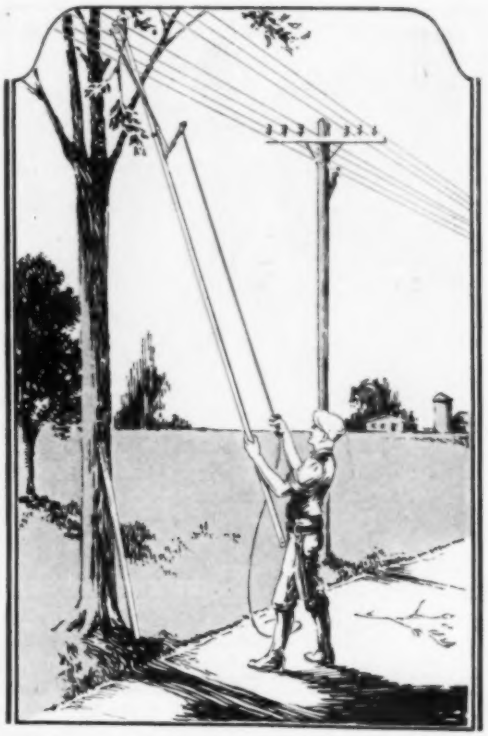
will dissolve the dirt and gummy oil. To keep the dial from getting spotty, it is best to remove it during a dipping treatment.

Schwarz rather frowned on these methods for clocks that are valued at all. "Though gasoline and kerosene will cut thick gum," he said, "a film is always left. I always give clocks a cyanide treatment after that to remove the film. If you value your clock highly, don't monkey with it and try such cleaning. Only a clock shop has facilities to clean away the cleaner."

FILMING OF COUNTY RECORDS SAVES TIME AND WORK

Official records of court proceedings in King county, Washington, and other legal matters have been photographed on motion-picture film so that, in case the originals are destroyed, duplicates may quickly be obtained. The task required 1,200 reels, and involved 400,000 separate descriptions and 1,600,000 recorded instruments. The work was completed in about seven months. More than three and one-half years would have been needed to do it under old methods. The photographing was done in the vaults of the county auditor, and the projecting and indexing in a building especially fitted for the purpose. For the indexing, a battery of 100 projecting machines was used. The reels are of non-burning film and have been stored.

Making an Index of the Records from the Projected Negatives



Working the Trimmer with the Rope Where Shock Might Be Received from Electric Wires

TREE-TRIMMER IS INSULATED AGAINST ELECTRIC SHOCKS

Keeping cut-away branches of trees from electric wires is a necessary but sometimes hazardous task, especially if the cables carry high voltages. To simplify this work, an insulated tree-trimmer has been devised. It is equipped with an insulator thirty inches long and capable of resisting 105,000 volts, the poles are made of shellac-treated spruce, and the lever that operates the cutting knife is pulled with a rope. The cutter will sever branches up to one and one-fourth inches in diameter, leaving a clean wound that is not likely to damage the tree. Extra sections provide for increasing the length of the pole.

Racer Wearing Mask Which Collects Expired Air So That the Energy Expended Can Be Measured

ENERGY TESTS ON FOOT RACERS DEVELOP TRACK TEAM

How much horsepower is represented in the leap of a racer as he starts at the gun? How much speed does he gain in the first twenty yards? How soon does he begin to get tired? These and similar questions are answered by means of special apparatus which a British scientist has developed to aid coaches in training teams and to give the athlete a more definite idea of his own performance. One of the units employed is a mask arrangement which collects expired air so that measurements may be taken as to the amount of energy required for the race.

SEEK TARNISH-PROOF SILVER

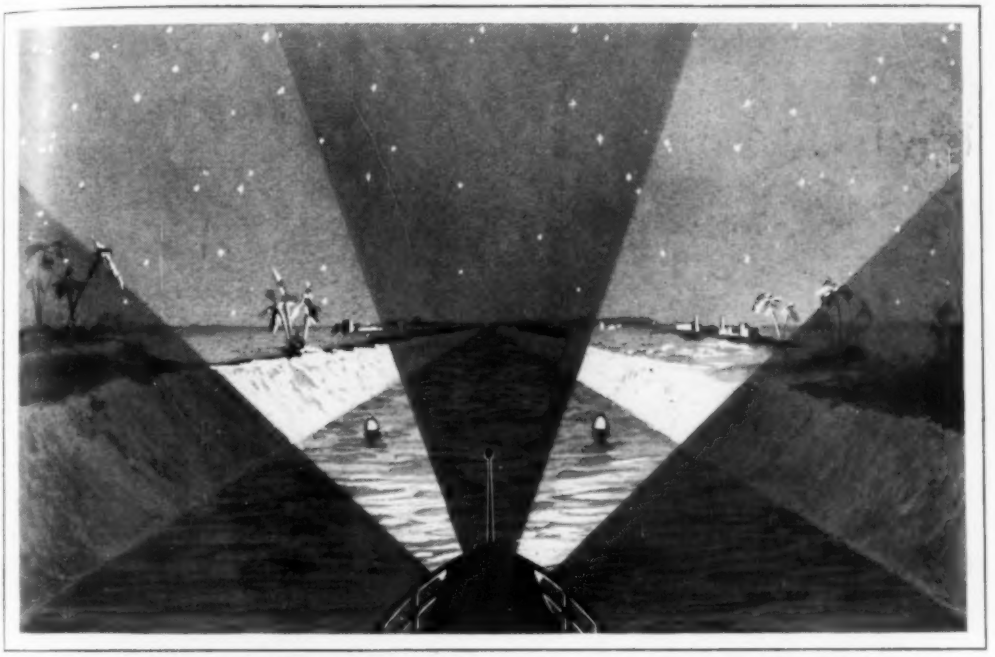
With a view to increasing the use of silver, the bureau of mines is conducting a series of experiments in an effort to find an alloy of the metal that will not tarnish. Although completely satisfactory results have not yet been attained, several kinds have been developed that will not tarnish as readily as sterling. Alloys of cadmium and silver, and zinc and silver are the most highly resistant to tarnish, but they have low tensile strength and therefore are not suitable for most practical uses. Antimony or tin, added to a mixture of silver and zinc, produced good results, while the introduction of twenty per cent gold in an alloy containing fifteen or twenty per cent of zinc or cadmium, yielded a hard yet workable material that also resists tarnish.

DOG HEROES OF WORLD WAR HONORED IN CEMETERY

Since the World war, numerous additions have been made to the graves in the pet cemetery at Hartsdale, N. Y. They mark the last resting places of dogs that belonged to various members of the A. E. F., some of whom owe their lives to the faithfulness of their canine pals. A monument at the entrance to the burying ground features the bronze figure of a police dog, and bears an inscription stating that the monument was "erected by public contribution by dog lovers to man's most faithful friend for the valiant services rendered in the World war, 1914 to 1918." Some stones at the head of the graves bear a photograph of the dog, and such epitaphs as "Good Old Pal," "True to the End," "Born a Gentleman—Died a Hero," are to be found. The cemetery was started in 1896. Besides dogs, many other pets are buried there, including monkeys, a lion, sheep and a canary bird.

Monument in Honor of Dog Heroes of the World War; It Stands at Entrance to Pet Cemetery

SPLIT LIGHT ENDS GLARE DANGER IN SUEZ CANAL



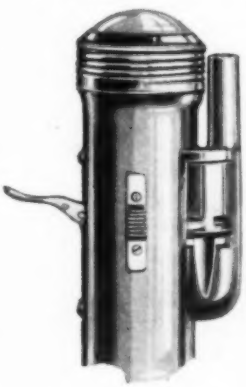
Illustrating the Effect of the "Split-Beam" Headlight for Boats on the Suez Canal, to Eliminate Glare in the Eyes of Approaching Pilots; Guide Buoys Are Plainly Visible

Boat traffic through the Suez canal at night involves lighting problems somewhat like those on automobile highways. The glare from one ship, shining into the eyes of an approaching pilot, has been found objectionable and a menace to safety, so a "split" reflector has been designed. It enables a passing boat to light up the buoys at the sides of the canal but eliminates the beam straight ahead, giving an oncoming navigator an unobstructed view.

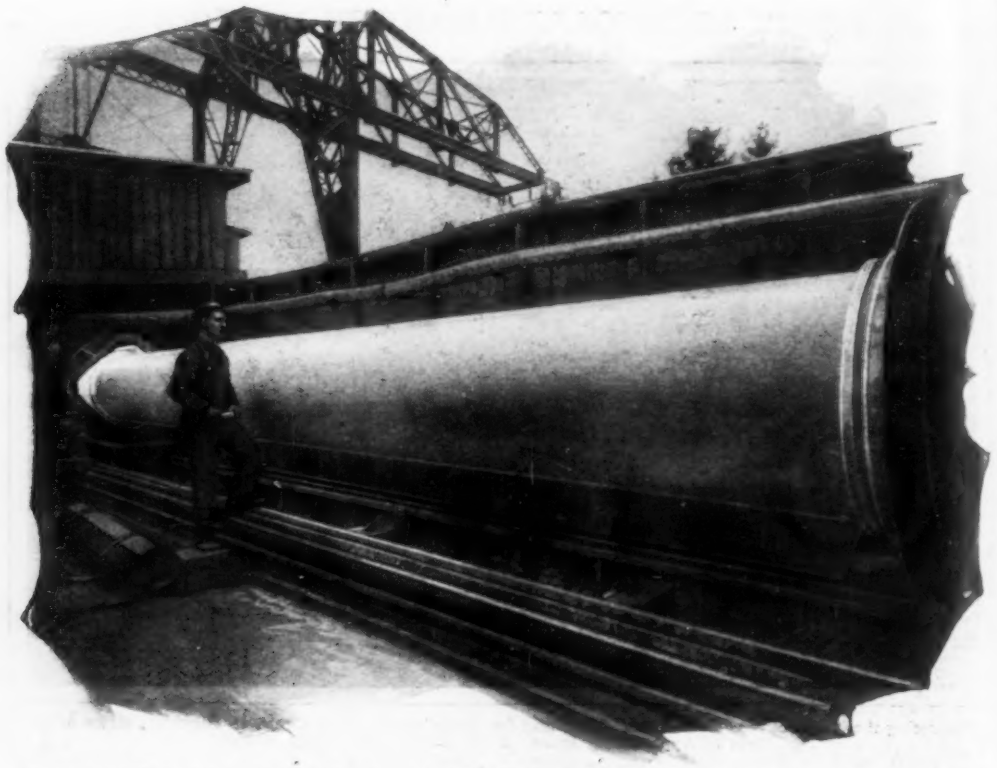
GAS-ELECTRIC RAILROAD TRAIN HAS SMALL CREW

Locomotive, passenger, baggage and mail cars are combined in one unit in a coach that is now in use on a western railroad. It generates its own power through an engine, burning a light fuel oil to drive generators that supply current to motors geared to the trucks. The cost of operation is said to be about one-third of that for an equivalent unit of steam train. The motor develops 275 horsepower, and is capable of pulling two or three trailer cars. It demands only two men, a conductor and motorman. The car is seventy-two feet long, burns a lighter grade of oil than others, develops high speed and is said to produce little more smoke than an automobile.

GUN MOUNTED ON FLASHLIGHT GIVES DOUBLE PROTECTION



For household protection, for campers, watchmen, railway detectives and others, a combination flashlight and seven-shot revolver has been placed on the market. It directs a powerful beam for a distance of 300 feet and this helps in aiming the weapon. The trigger that fires the pistol folds tight against the case when not in use, to prevent accidental discharge. The light switch is on the side, and pistol or flash may be used separately.



Turning a Marble Column, Thirty Feet Long and Four Feet in Diameter, in a Giant Lathe; Smooth Columns Are Often Made in One Piece, While Large Fluted Ones Are in Sections

The Romance of Marble Cutting

Age-Old Methods Still Used in Turning Out Slabs and Columns for Modern Building

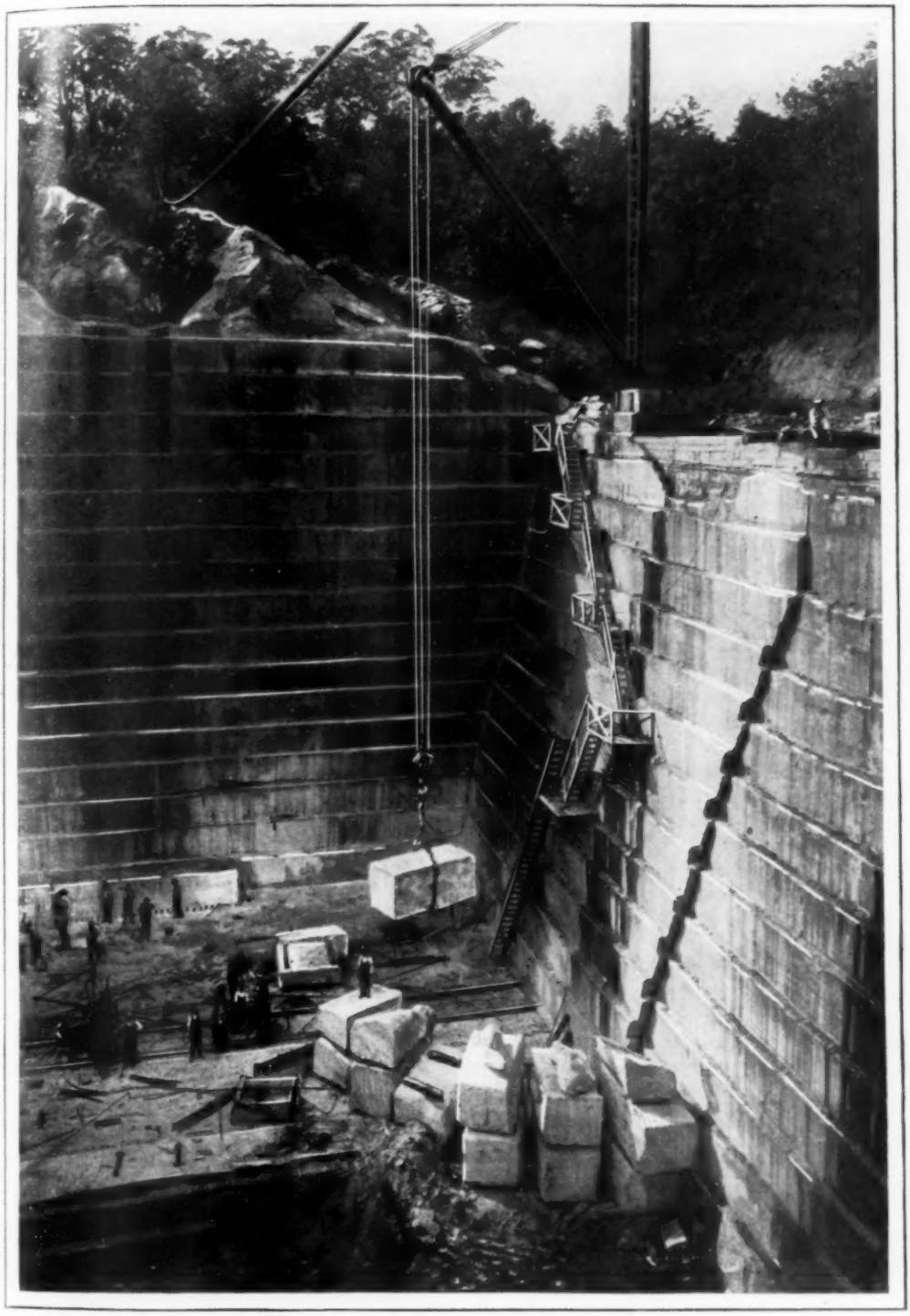
By N. C. McCLOUD

IF an ancient Egyptian could visit the Vermont or Georgia quarry regions he would find the marble workers cutting stone by the same primitive method that prevailed in the days of antiquity.

But the saw of the marble mill is not a saw in any sense of the word. Accurately described, the blade is a strip of soft iron, fastened in a frame, and moved back and forth along the channel that is being cut through the stone. The saw itself does no cutting. The actual work is performed by sharp particles of sand fed to the blade by a stream of water.

The saws work in "gangs" in a frame, and are set at intervals regulated by the thickness of the slabs to be cut. The use of these saws dates back many centuries before the dawn of Christianity. There have been changes in the form of application, but modern engineering has discovered no effective substitute for the use of sand and water in the process of converting blocks of stone into slabs. Iron frames are employed for holding the blades, instead of the wooden holders of antiquity, and there has been marked increase in the number of saws placed in a single gang, but the method itself is unchanged. The first saws were moved to and fro by the hand of man; then came water power, steam and electricity.

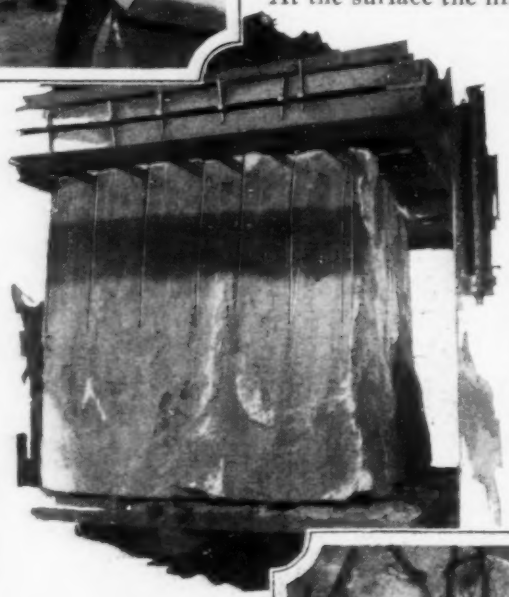
The casual visitor will be amazed at the quantity of sand required for effective saw-



Courtesy Georgia Marble Co.

Modern Cutting Tools Saw Out the Huge Blocks of Marble as the Quarry Level Slowly Sinks, with Almost Perpendicular Sides, the Steps Too High for Climbing

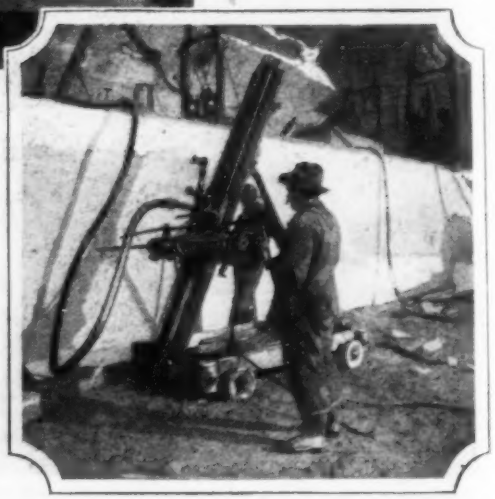
ing operations. For the general run of marble, the volume of abrasive runs close to the size of the block itself. With the harder varieties of stone the weight of the sand is even greater. Marble is sawed at a rate of one and a half to two inches an hour. Hard stone yields less readily. Once started, however, the blades move back and forth twenty-four hours a day until the largest block has been separated.



As received from the quarry, the original blocks vary in size, according to the use for which the stone is intended. The most common dimensions, perhaps, are six by four by four feet, with a weight of several tons.

In the early days of the American industry, the first steps in opening a quarry involved the use of drills and blasting powder, for uncovering the deposits of marble lying beneath the surface. The stone uncovered by the blasts was then split off in great chunks by means of blasting and the use of steel wedges. The employment of explosives, however, was so destructive that much good stone was spoiled, and for this reason the blasting was abandoned in favor of hand-drilled channels which separated the marble into blocks of convenient size.

In most quarries the stone is taken out from an upright face, offering a wall of solid marble. The first block prepared for removal is known as the key, because it opens the way for general operations. Whether done by derrick or tramway, the hoisting operation demands extreme care to prevent damage to the heavy blocks, and especially is this true in the removal of the great pieces intended for long columns. At the surface the lifting derricks load the blocks on the cars for the mill. The modern marble mill is an object lesson in efficient arrangement. Stone is heavy and excessive handling adds much to the cost of the finished product. For this reason everything is planned for orderly sequence in the journey of the stone through the plant. The huge blocks are unloaded from the



Courtesy Vermont

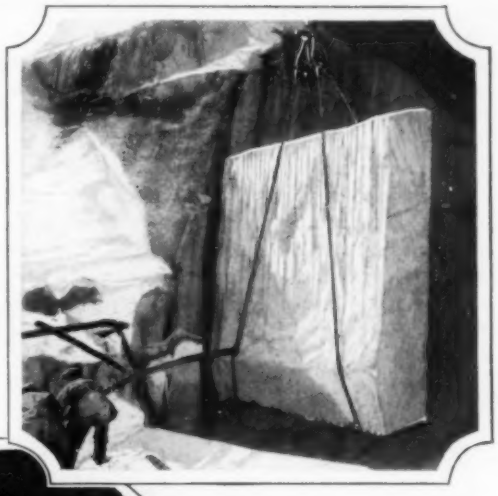
Pneumatic Chisels and Electric Drills Do Much of the Work; Center, Gang Saws Cutting Layers

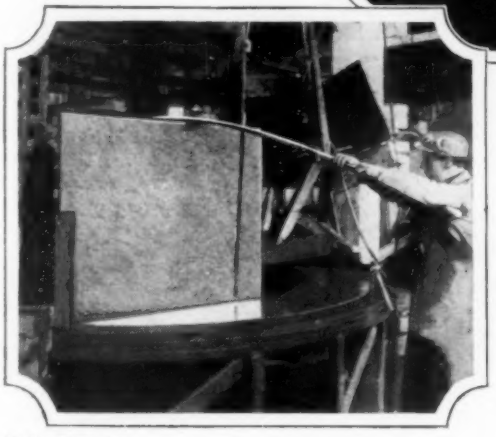
cars by means of traveling cranes, and are piled on transfer cars to be hauled by locomotive cranes to the gang saws within the mill. From the saws the individual slabs proceed to the finishing shop, where they are dressed and polished to the required dimensions.

In its passage through the finishing shop, the marble receives varied treatment. To produce a slab of exact dimensions, the rough material that has been turned out by the saw is trimmed and sent to a rubbing bed, a revolving cast-iron plate on which it is ground true to size and thickness under the abrasive action of sand.

Constant rotation on the true plane of the bed results in giving the slab uniform thickness and properly squared edges. For curved and irregular surfaces the rubbing is done by hand, with a simple instrument made of a marble brick, passed back and forth with sand and water.

Recent years have seen marked improvements in the methods of cutting curved pieces, moldings, cornices and balusters. For this work a carborundum wheel is set into a lathe, and, by means of a steel tool, is cut into a shape exactly the reverse of the pattern that is to be wrought in the marble. This negative then cuts into the face of the marble block as the latter travels on the machine bed beneath.





Marble Company

A Rubbing Bed for Polishing, a Figure for a Fountain at Madison, Wis., and a Block Being Hoisted

The process of fluting large columns involves the use of diamond saws in conjunction with the carborundum wheel. The saw of this type makes a series of parallel cuts in the places intended for the deepest part of the troughs. The fluting operation is completed with a carborundum wheel.

Most columns are made up of sections known as "drums," because of their shape. Some of the largest sections ever produced are those used in the Lincoln Memorial, recently completed at Washington, D. C. Each drum in the columns of this massive structure has a diameter of eighty-nine inches and a length of fifty-eight.

The solid columns with smooth face, seen in many pretentious buildings and memorials, are produced by means of a

lathe, with the same ease as iron or steel is turned.

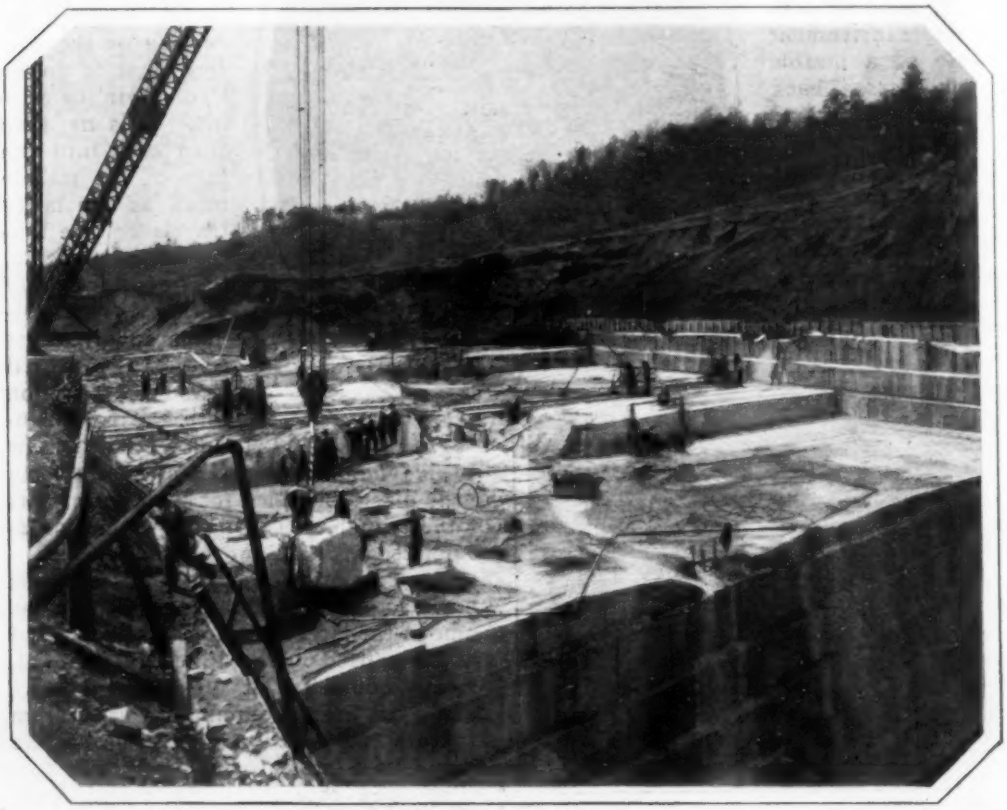
To produce ornamental surfaces, the marble carver of today works with pneumatic cutting tools. He still uses the hammer and mallet in places, but his usual chisel is driven by compressed air.

Marble is a form of limestone, of such close structure as to cause it to take a polish of extreme fineness. In point of hardness there is wide variation in marbles of different types. Besides taking a high polish, it has the important characteristic of permitting penetration of light. Some marbles are waxy in appearance, because of this property, while others are milk-white and opaque. The best Pentelic marble, used by the old Greek sculptors, has been found to admit light to a depth of more than half an inch. In Parian marble, from which the Venus de Medici was sculptured, the penetration is more than twice as great. Carrara marble, used by Michelangelo and Canova, is penetrated to more than an inch and a half. In thin sections, white marbles are almost transparent. Some marble is porous, admitting water and dirt with resultant freezing and discoloration.

The change of limestone into marble, in past geologic ages, came through pressure or heat, or both. The formation has been reproduced experimentally through the application of heat and pressure to calcium carbonate.

KNOT REMOVER FOR BOARDS ALSO PLUGS HOLES

Savings of lumber are promised by a recently patented electric unit to cut the knots out of boards and fit a threaded plug into the hole. The machine is said to be so simple that a boy can operate it, removing from sixty to ninety knots an hour and plugging the holes. The outfit works on hard or soft lumber and is adapted to boards up to three inches, either rough or



When the Thin Layer of Surface Earth Is Stripped Off, a New Section of the Quarry Can Be Opened alongside the Old, Which Has Grown Too Deep to Be Worked Profitably

finished. As the knot is cut out, a thread is formed in the sides of the hole and the plug is threaded to fit this. It is inserted flush with the board and turned so that the grain is in the same direction as that of the timber. No glue is required and it is said that green lumber will dry around a dry plug without splitting. For larger cut-outs two plugs can be utilized.

PLOW TRACTOR NEEDS NO DRIVER

Farmers will be able to help their neighbors with their work, go to town, or listen to the radio while their fields are being plowed, if the invention of a Nebraska man is generally adopted. It is a self-steering attachment for a tractor, permitting the outfit to work without a driver after the first, or guiding furrow, has been made. If the machine leaves the row, the guider automatically stops it. Essentially, the unit is composed of a piece of aluminum, covering a pipe attaching it to the tractor, and a curved piece of sheet iron that slides along the furrow. It is held in place by a heavy spring which is released should the plow stray out of its course, and the power is automatically shut off. The guiding furrow is made with rounded corners so that the plow can turn them easily. In a demonstration, the driverless tractor plowed a twenty-acre field without guidance from an operator, requiring only replenishment of the gasoline and oil. The attachment can be fitted to any type of tractor.

Steering "Foot" That Guides the Tractor

Cloth Trap Inside of Which the Fog Was Produced for the Picture and Held from Blowing Away

SHIP INCLOSED IN CLOTH SCREEN FOR TAKING FOG PICTURES

In order to keep smoke, manufactured in smoke pots, on board a ship for producing a fog effect, the vessel was inclosed in a cloth screen to trap the fumes. When enough had been collected, the coverings were removed and the photograph made.

ANTIQUE FINISH FOR NEW WOOD SECURED WITH SOLUTION

New wood can be treated to give it an aged appearance with a mixture of a solution of hydrogen peroxide and hydrochloric acid, four parts of the former to one of the acid. The liquid is painted on, allowed to dry, and the antique coloring develops quickly. The acid may afterward be neutralized with ammonia. Various colors may be produced by additional treatment that causes metallic deposits in the wood.

Mirror Bracket in Place, Showing How It Affords Person in Chair Front and Rear Views of Head

MIRROR SET FOR BARBER CHAIR AIDS BETTER HAIR CUTS

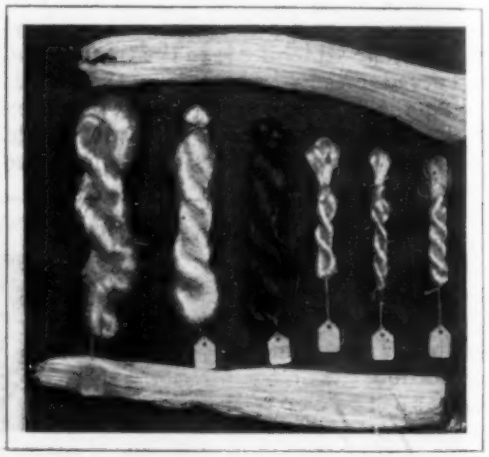
Clamped to the barber chair, a double mirror arrangement gives a clear view of the front and back of the patron's head, so that he may be sure of a satisfactory cut. The supports are not in the way and the mirrors always remain in proper position, as they are raised, lowered and revolve with the chair. A pedestal type on rollers has an adjustable spring to obtain any height desired.

PROPELLER BLADES OF CANVAS RESIST CORROSION

High-powered airplane-propeller blades made from ordinary canvas pressed into a noncorrosive product of metallic strength are to be used on the navy department's training planes. The new material is likewise used for the manufacture of pulleys. Because of its water-resisting and moisture-proof nature, parts manufactured of this material have been accepted as standard equipment by the United States army and navy. This latest propeller is brass-tipped and is of special interest to aviators because of its lighter weight, smoother action and absolute absence of corrosion or warping in storage or in service. It is especially adapted to use on seaplanes because the spray does not damage it. The substance is chiefly cotton, layers of canvas being impregnated with chemicals and pressed into material of steel-like hardness.

CORNSTALKS MADE TO YIELD SILK AND EXPLOSIVES

The problem of commercial utilization of cornstalks is believed to have been solved after many years of effort. The process of Dr. Bela Dorner, a Hungarian chemist, has been brought to the United States, tested by experts and pronounced practicable and economical. By this method artificial silk has been produced from cornstalk pulp. The technical obstacles have been the pith and knuckle of the cornstalk, which could not be removed economically. The Dorner process grinds up the entire stalk, which means that it is possible to convert a waste material into abundant supplies of pulp for making paper, artificial silk, motion-picture films, explosives, celluloid, lacquers, artificial leather, pyralin and other products. Now the corn-belt farms destroy annually more than enough cornstalks to supply the pulp requirements of the United States. By-products of the Dorner process can be used in the manufacture of alcohol, cattle feed, butanol, furfural, lactic acid, etc. These by-products will be an additional revenue.



Samples of Artificial Silk Made from Cornstalks through Improved Process Developed by Hungarian Chemist

One of the Rescue Attempts That Failed; the Plane, Flying Low, with Rope Suspended, Was Guided over the Stranded Vessel in an Effort to Get the Line Aboard

MOTORBOAT DEFEATS PLANE IN RESCUE OF CREW

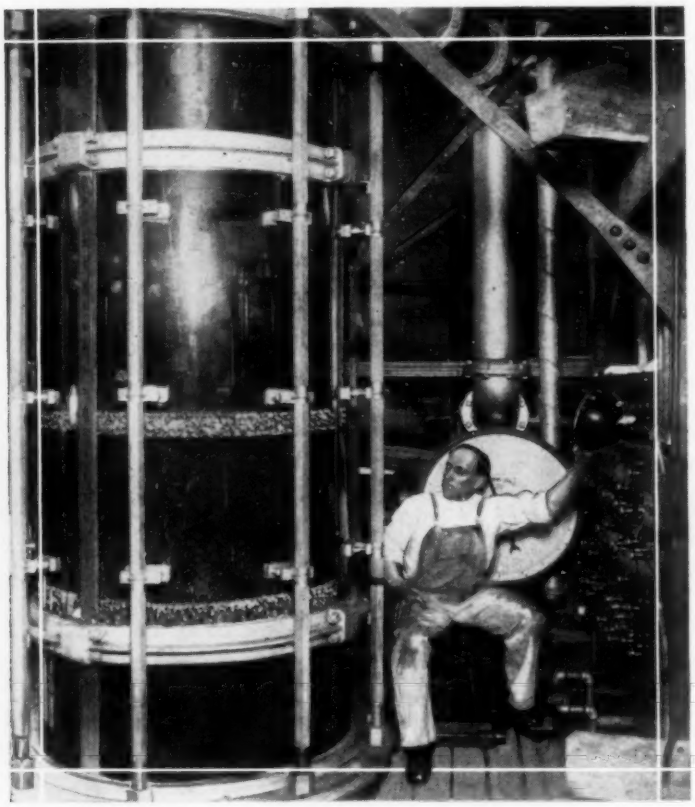
Thirty men, stranded four days without food on the steamer "Collingdale," which went aground off Morocco, were rescued in a small motorboat after unsuccessful attempts were made to get a line to the craft with the aid of a seaplane. When repeated efforts at dropping a cable on the deck of the vessel failed, a veteran Spanish skipper put forth in the motor launch and brought the men to shore in two trips.

CENTURY-OLD ORANGE GROVE FLOURISHES IN FLORIDA

Budded on native-soil orange stock, from seedlings brought to this country during the Spanish occupation of Florida, an orange grove at Allenhurst is still thriving. Measures have been taken to place it under the protection of the state, national and local interests so that it may be preserved for many years more. The grove is believed to have been planted about 1830. Some fifty of the original trees are still standing and produce about three boxes of fruit each. Some are fifty-four inches in circumference one foot above the ground, average from twenty-five to thirty feet high and have an average crown spread of sixteen feet. Since 1914, the grove has been better cared for, the application of fertilizers having increased the vigor of the trees.

AUTO BATTERY WINDS CLOCK ON STEERING POST

To keep accurate time and eliminate the bother of winding by hand, a magnetic clock, attached to the automobile steering post, is kept wound through an electromagnet energized by the car battery. A coil spring is tensioned every thirty seconds, so, being fully wound at all times, the clock is little affected by road shocks or vibrations of the motor. A screwdriver is the only tool that is required to attach it.



An Important Unit of the Grading Apparatus, the Huge Glass Test Tube Where Grain Is Mixed with Chemical Solutions

SEE BETTER CROPS AND SEEDS IN CLEANER AND GRADER

Field and garden seeds of practically every kind and variety grown in the world can be cleaned and graded in a new apparatus recently built in Chicago at a cost of $275,000. Through the use of chemical solutions of different strengths, compressed air and vacuums, seeds are entirely freed from weeds and foreign matter and then separated into strata depending upon the weight of the seeds. The process will make it possible for farmers and gardeners to plant only the finest of the best seeds, increase the number of pounds per bushel and add greatly to the yield per acre. In the handling of corn for example, this apparatus, eighty-eight feet high, separates the light and diseased kernels into one group and heavy high-quality kernels into another. Almost an unlimited number of grades of grain can be made. The apparatus cleans and grades all of the grains commonly grown in North America, including corn, wheat, rye, oats, barley, clover, alfalfa and soy beans. Vegetable and flower seeds are also cleaned and graded by this new process. Clover seeds contaminated with noxious-weed seeds, which are often of the same size and cannot be removed by any machine now used in cleaning and screening seeds, are easily cleaned and graded by this method. The whole process takes place in a huge glass test tube, nine feet tall and four feet in diameter. A thousand pounds of grain is separated at a time. The invention makes it possible for farmers to plant seeds which will germinate, develop, bloom and fruit at the same time. It will put the world's seed situation under laboratory control.

TINY STEEL MOTORBOAT SPEEDS TWENTY-TWO MILES AN HOUR

Weighing less than seventy-five pounds and but three feet wide, a ten-foot outboard-motor boat develops a speed of twenty-two miles an hour. It is made of steel, has a flat bottom and is provided with an air chamber under a waterproof canvas deck, so that it will float even if filled with water and can carry 300 pounds.

Tiny Outboard Racer in Full Speed

Cooking-Utensil Bands Get Harmony Out of Tinware in the Latest Scheme to Raise Funds for Charity

HAVE you heard the latest recipe from the kitchen?

Take one tin funnel, medium size, a half dozen tin spoons and three or four extension curtain rods, coat the ends with soldering flux, heat slightly with the iron and apply a good grade of solder. Add one of those queer little tin instruments called a "kazoo" at one end and serve it up in the music band under the nom de plume of a trombone.

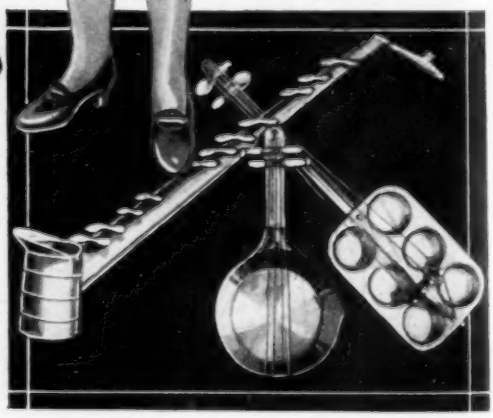
That's the basic formula for the dozens of recipes that go to make up Susie's Kitchen Band, the tinware "sinkopaters," who are getting harmony out of the cook's cooking utensils, and making money at it.

Details of Baby Saxophones, Horns and an Accordion, All Built from Odds and Ends of Kitchen Tinware by a Woman Who Learned to Solder in Order to Help Raise Funds for Charity

Imagine a large band of fifty pieces, completely equipped from drums to French horn and from clarinets to the strings of the bass viol. Such a band isn't unusual, but if everyone of the instruments is made out of kitchen tinware soldered together, and everyone, regardless of what it looks like, is held to the lips and blown into, you have something decidedly novel.

Where the idea of the kitchen band originated nobody knows for sure, but there is evidence that it came out of the Kentucky mountains by way of southern Illinois. A dentist's wife in East St. Louis, Ill., Mrs. Harvey S. Smith, heard about such a band, and, after a course of soldering lessons under the tutelage of her radio-building husband, proceeded to make a full set of instruments, guided only by a postcard photograph of a similar organization. Mrs. Smith's idea was to create a novel form of entertainment to raise a charity fund for one of her clubs. She succeeded so well that others wanted to do the same, and a brisk trade in rented band instruments sprang up. A kitchen story in scenario form was written to go with the concert and add hilarity to an already laughable performance.

The instruments themselves are as varied as the ingenuity of the maker. They include about every odd and end that can be culled from the kitchen. Tin cans soldered together, with tin ice-cream spoons as keys, a flour sifter at one end and a kazoo at the other, become a moaning saxophone. Frying pans with picture-wire strings and split clothespins for keys are transformed into ukuleles. A washboiler top, fastened to an old mop handle and strung with picture wire, makes a neat-appearing cello. Tomato cans, graduated in size, soldered to form a circle, with a washbasin at the end and tin spoons for keys, make a passable bass horn. The drum is a dishpan covered with oilcloth. Extension



Pair of Soloists from a Los Angeles High-School Faculty Band and Some of the Instruments Made by Mrs. Smith for Her Bands

"Sinkopaters" of a Los Angeles School Faculty, Led by a Drum Major Wielding a Feather Duster for Baton; the Instruments Show the Wide Variety of Utensils Pressed into Service

curtain rods make excellent slides for such things as trombones, or extension coat hangers can be used for the same purpose.

If you want a tom-tom, a worn-out washboard is excellent, particularly when a retired slipper is used as a mallet. Bake tins, with the handles of other pans soldered to their bottoms and connected by cold-starched and pleated muslin, can be converted into accordions. For the director's baton, a curtain rod is excellent, though a kitchen band composed of members of the faculty of a Los Angeles high school is ruled by a feminine drum major armed with a feather duster.

An entire outfit of instruments for a good-sized band costs little more than five dollars, plus several hours' work with a soldering iron.

And for musicians, one need not have a single person in the band who can read one note of music, for the kazoo plays when the player hums, and anybody who can hum a tune is eligible for membership. One kazoo alone doesn't make a band, but when twenty-five or thirty or more are hummed in unison, the result is surprisingly good, with a stirring quality and rhythm that is startling. The history of the kazoo is as shrouded in mystery as the origin of the kitchen band, but one story is that it goes back to the days of Cleopatra, when a frightened slave, ordered to play on a reed, extemporized with a crude hollowed stalk.

The bands were such a success at the start that, by the time a half dozen sets of instruments were on the road constantly, being rented to organizations all over the country, Mrs. Smith turned to uniforms. Brilliant red caps, scarfs and sashes, garnished with small tin spoons instead of gold frogs, and with toy knives and forks to add a special touch here and there, carried the kitchen band one step further. The demand for instruments and uniforms became so great that it was necessary to design special boxes for packing and shipping them. At that, a full set of instruments and uniforms for a twenty-eight-piece band rent for only $12.

The maker saves the tin cans that pass through her kitchen and buys the rest of the supplies at a dime store. With constant practice, she has become proficient with tin snips and soldering iron and has reached the point where she not only doesn't cut her hands any more, but is seldom scratched. Her bands, in the last three years, have earned more than $4,000 for women's organizations, in addition to the profits from others designed in imitation of the originals. The original concert before the Wednesday club netted $150.

Illustrating How Paint-Spray Gun Is Adapted to Overhead Work and Reaching in Corners

PAINT GUN TO REDUCE WASTE WORKS IN ANY POSITION

For the application of paints, varnishes and lacquers, a spray gun recently introduced is so adjusted that it will function in any position, an important advantage for overhead work, reaching under parts and other special uses. It is said to give a continuous spray without sputtering, uses all the material in the supply cup and is easy to control. An additional feature is that it rests comfortably on the side of the hand so that the fingers do not have to stand the full strain of supporting it.

WETTING BRICK AFTER LAYING NO HELP TO WALL

Wetting brickwork for a period after laying, does not add to its strength, according to tests by the bureau of standards. For more than six months, walls were built and crushed, brick of different grades used and pressures ranging from 2,500 to 6,500 pounds to the square inch applied. The panels were covered with burlap which was sprinkled at intervals and then removed, allowing the brick to season for about sixty days. While the dampness tended to strengthen the mortar, it weakened the rest of the wall, it was found, and the variation in strength between the walls which had been moistened and those which were not, was considered insufficient to justify the practice of wetting the brick.

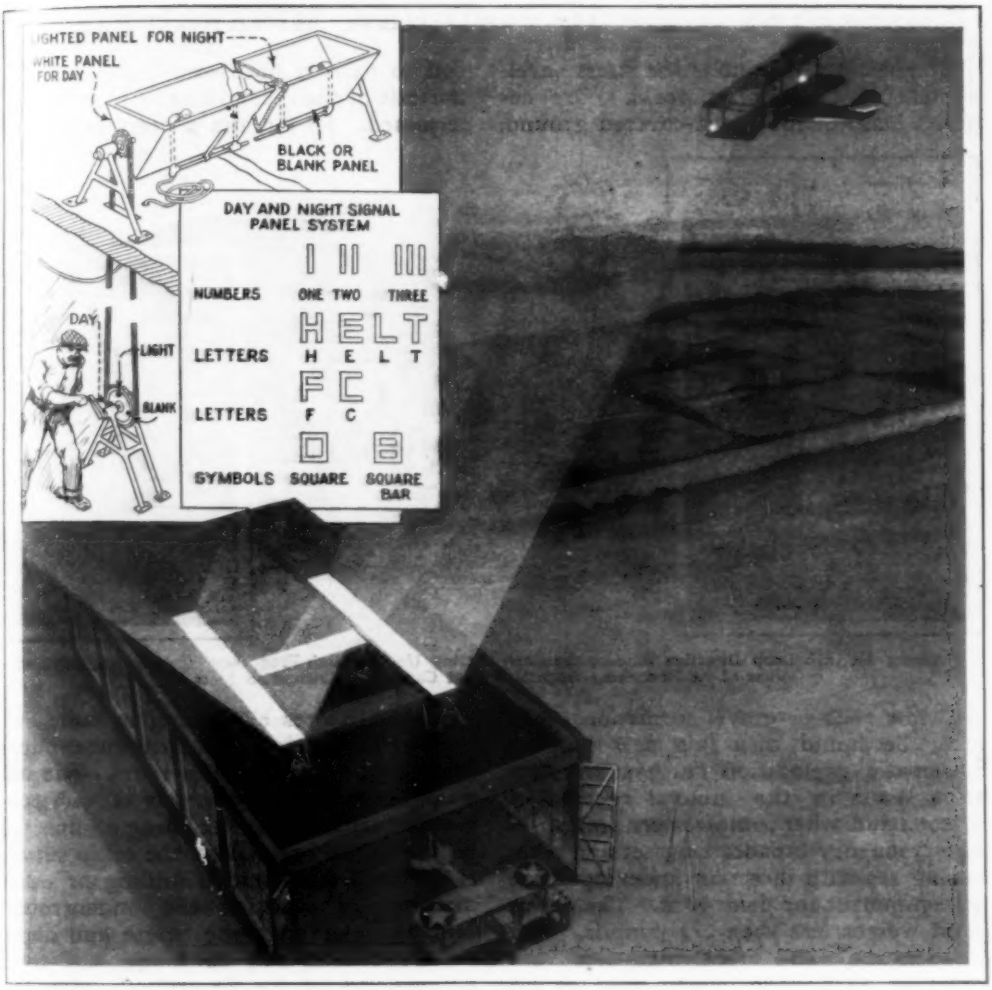
KANGAROO BEATS RACE HORSE IN SPEED TEST

One of the fastest Australian race horses, ridden by an expert jockey, was decisively defeated by a kangaroo in a recent trial near Sydney. The contest was described as a "procession" with the horse pounding away and losing at every bound of the big kangaroo. The animal covered more than thirty feet at a jump when at full speed.

HANDHOLD MERRY-GO-ROUND AIDS CHEST DEVELOPMENT

Healthful exercise and amusement are provided in a steel unit for the playground. It is constructed on the principle of a merry-go-round, consisting of a revolving rack turning about a center pole set in concrete. Instead of sitting, the riders cling to the rack with their hands. This gives beneficial stretching exercise and promotes chest development as well as strength of arms and fingers. Patents have been asked for the device.

Combining the Merry-Go-Round and Trapeze for Fun and Exercise



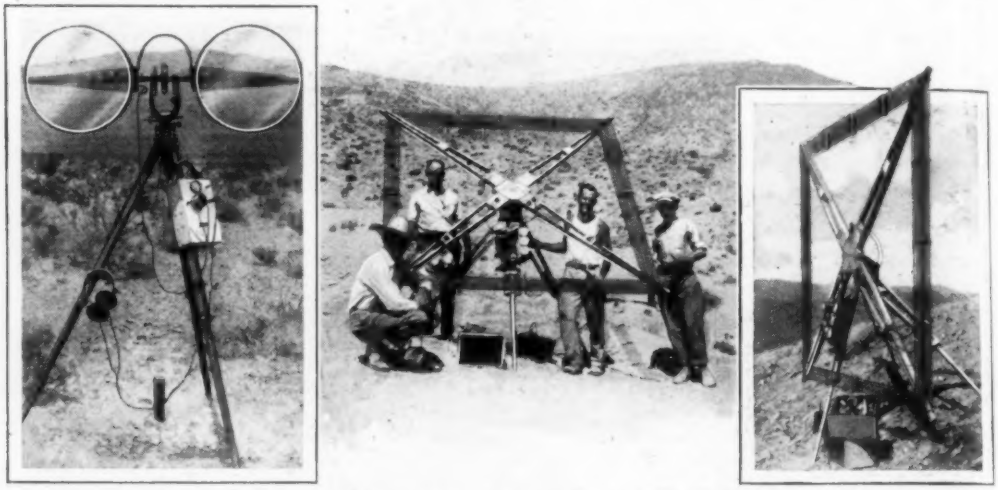
Guiding Airplane Pilots with Troughs of Light; Drawing of the Signal Apparatus as Installed on Top of Hangar, How Signs Are Operated, and Drawings of the Eleven Characters

ELECTRIC AIRPLANE SIGNALS REPLACE CANVAS STRIPS

A simple electric-signal system, visible both by day and night and designed to replace the cumbersome canvas ground panels invented during the war, has been developed by the aeronautics branch of the department of commerce. Five triangular metal troughs, mounted on top of the hangar so that they can be revolved to show either a white service by day or lights by night, or a black surface when not in use, are employed, and with them it is possible to form three numbers, seven letters and one square, or a total of eleven different signals. The troughs consist of two sides, three feet in width, joined together to form the sides of a triangle, with a three-foot open face. The inside of the open trough is painted white for day use and fitted with a row of electric lights for night signaling. Two of the troughs, twenty feet long, are mounted parallel to each other, with three shorter ones between them at right angles, the whole forming a twenty-foot square. Each trough is swung between supports and fitted with a sprocket and endless chain, so that it can be revolved from the inside of the hangar, where a simple switchboard enables the operator to turn on the lights in any one or any series of the troughs mounted on the roof.

RADIO EYES HELP TO FIND NEW MINERAL FIELDS

Prospecting by radio is the latest development in the mining world. Ore deposits beneath hard lava-covered ground, coil to various positions, the location of the axis of the second magnetic field is determined. So far, the process is applica-



Receiving Set with Loop Direction Finder; the Crew Setting Up the High-Frequency Broadcasting Set and View of the Energizing Apparatus That Causes the Current to Flow

or below rock or gravel formations, may easily be found with this new process. Systematic exploration surveys are now being made in the mineral regions of Arizona and other southwestern states. A high-frequency broadcasting set and a receiving set with direction finder compose the equipment for field work. The entire outfit weighs less than 275 pounds. The broadcasting and receiving sets are mounted on tripods which are set up quickly at desired points about the territory to be surveyed. Four or five men are sufficient to operate the apparatus under average conditions, but when the terrain is very rough, the crew is increased. In order to locate an unknown ore deposit, which may be five or 500 feet below the surface, it is necessary to induce high-frequency alternating currents to pass through conductive ore deposits.

The current sent out from the broadcasting set creates a secondary field when there is some such ore beneath the surface of the ground. A special receiving set is attached to the direction-finding coil. This latter apparatus is mounted on an ordinary surveyors' transit, and is easily carried about the field. By using the earphones and revolving the direction-finding

ble only to ores containing metallic sulphides in sufficient quantity to conduct high-frequency electric currents. The sulphides include such minerals as lead, copper and iron. In order to determine the nature of the ore deposit the radio survey is followed by diamond drilling or other methods of reaching the underground mineral. Although the length and depth of the deposit can be found, the total volume cannot be determined with the present apparatus. With the new process the explorations may be conducted in old mines hundreds of feet under ground as readily as on the surface.

HOUDINI'S BOOKS ABOUT MAGIC IN LIBRARY OF CONGRESS

One of the most unique collections of books in the world, 5,147 volumes about magic and psychical research gathered during the lifetime of the late Harry Houdini, is now in the Library of Congress at Washington, to which it was bequeathed by his will. The assortment was selected from all over the globe, Houdini having searched carefully through many catalogs and having advertised his wants in European and American cities. He considered

one of his choicest books, "Natural and Unnatural Magic" by Gantziony, dated 1489. It is in the author's script. Another volume is among the pioneer writings on the subject of spiritualism in this country. The authors were John W. Edmonds, a judge in New York, and George T. Dexter, a physician.

SWIM-POOL SWING GIVES THRILLS IN DIVING

Safety and added sport are features of a diving-swing apparatus for which patent applications have been filed. It is intended to be placed in water four feet deep, the swing extending out to depths safe for diving. The diver gets on the seat with ease, trips a foot lever when he is ready to start and soars in a wide arc ready to start the actual dive. Parts of the outfit are securely tied together by ground boards, which lie at the bottom of the pool or beach. The frame is sixteen feet above the ground boards, and the stairs are twelve feet high to the top platform. There is a well-braced apparatus to stop sidesway, while corrugated hardwood treads on the steps promote safety.

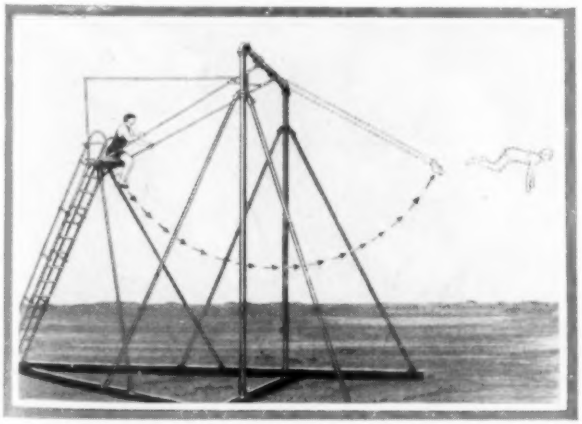


Diagram Drawing of the Diving Swing in Operation; Chief Caution Is to Have the Take-Off in Deep Enough Water

At the Outdoor Fur Store Where Pelts Are Sold to Autoists; the Proprietors Do Their Own Trapping in Alaska

ROADSIDE FUR STORE SOLVES HIGH-RENT PROBLEMS

Adopting the plan of the fruit and vegetable grower, a California trapper and his friend have established a fur stand on an automobile road near Los Angeles, where they exhibit and sell furs taken from animals caught each year in Alaska. The wayside store serves automobile patrons directly, saves the expense of rent in the city, and the racks on which the furs are hung afford good display.

MATCH AND TEE HOLDER EASY TO CARRY

One of the latest conveniences for the golfer is a pocket holder to carry matches and tees. It keeps the pockets clean and free from holes, simplifies changing from one pair of knickers to another, and the articles are kept where they can easily be reached. Besides the ordinary book of matches, the holder has space for long wooden ones and there is a scratcher on the back.

Sturdy Rest Keeps Banjo in Position and Away from the Player's Body So That Tone Is Not Muffled

BANJO HOLDER RESTS PLAYER AND IMPROVES TONE

To relieve a banjo player of the weight of the instrument and to insure freedom and relaxation for rapid execution, an upright holder has been introduced. It is said to improve the tone because the banjo is kept away from the body. The unit is adjustable to different heights and positions, is easily moved out of the way, as it has casters, folds up into compact space, and the bottom is so constructed that it serves as a footrest.

SHEEP STOP FIRE DANGER AROUND OIL TANKS

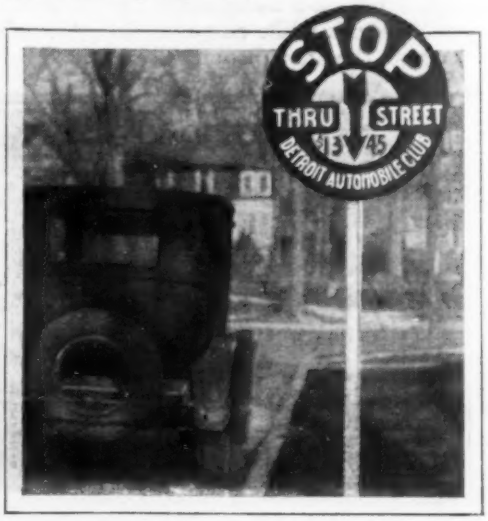
One of the most feared enemies of the oil company is fire and, to reduce danger from this source, a western concern keeps a herd of sheep grazing in the fields near the tanks. They keep the grass so short that there is little likelihood of a blaze spreading, should it start, and the plan involves practically no expense.

QUICKER DIAGNOSIS OF DISEASE IN NEW STAINING METHOD

Diseased tissue of the human body may be studied with much less trouble, and quicker diagnosis made, by an improved method of staining the cells, demonstrated by Dr. B. T. Terry of the Mayo clinic. Under former processes, samples had to be cut extremely fine and carefully mounted for microscopic examination, a process that took eight or more minutes, often while the patient was under anæsthetic. By the new system, sections may be cut with an ordinary razor without special regard for thickness. The stain affects only the surface of one cell layer and the light is permitted to pass through the rest as though they were not there. In less than a quarter of a minute, Dr. Terry prepared a specimen so that another physician could diagnose the case as malignant cancer.

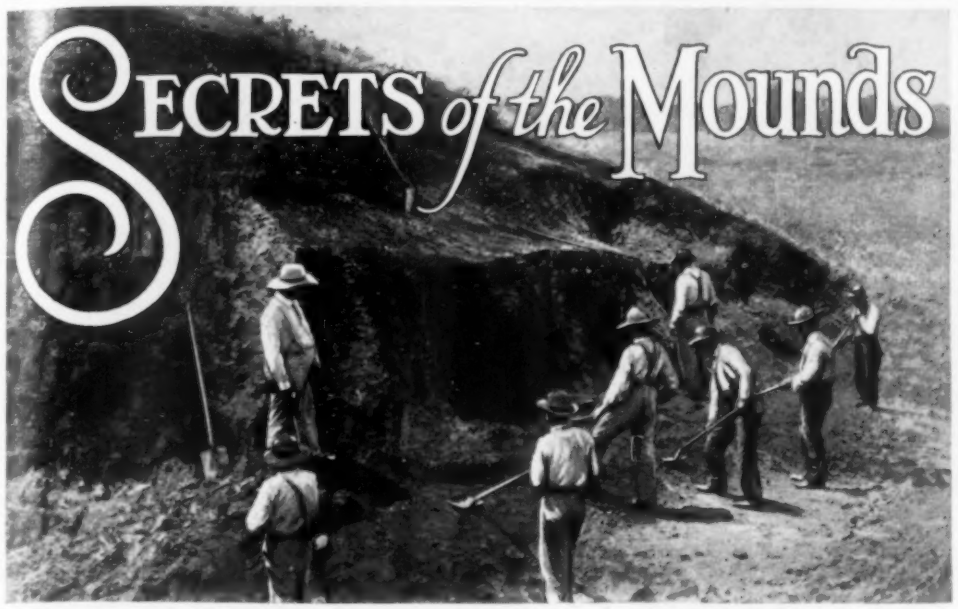
AUTO STOP SIGN TELLS COST OF VIOLATING LAW

To answer complaints of motorists who declared that they were being fined too heavily, and to give an additional warning at intersections, stop signs in Ann Arbor, Mich., bear figures showing what fine will be imposed if drivers violate the law. The plan removes all grounds for charges of unjust penalties, and is also calculated to make the motorist think before running any risk.



Figures below Words, "Thru Street," Show Amount of Penalty for Failure to Stop

SECRETS of the Mounds



Workers Digging into the Big Serpent Mound in Ohio, to Probe the Secrets of the Oldest Civilization in the Eastern United States, Antedating the Indians, the Explorers Found

By TRUMAN B. MILLS

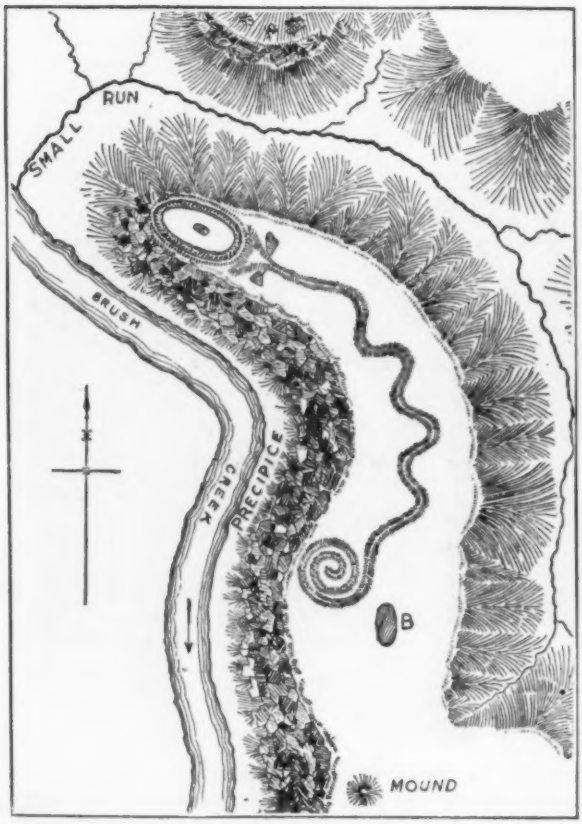
EVER since the discovery of America the secrets of the Indian mounds, thousands of which are to be found throughout the Mississippi valley and adjacent regions, have been sought. Even the Indians found by the first white settlers knew nothing of them. Scientists have attributed them to an early people who occupied these regions centuries before and had been subjugated or driven out by later nomadic or hunting Indians.

The fact is that the custom of mound building was not limited to the American continent. Mounds are to be found the world over, this having been one of the earliest methods of showing respect for the memory of the dead. Civilized man has naturally dug into these structures out of curiosity and for the purpose of study. Few mounds are to be found in the United States that do not show some evidence of molestation. Indeed, the early settler often declared a holiday in slack times to make exploration attempts. Adventurers also dug into them in search of buried treasure, but the pot of gold they sought was ever an elusive one, and the reward was usually only some decayed bones.

The state of Ohio has 5,000 or more ancient monuments of the mound builders, and this region has been the focus of more mound-excavating parties than any other in the Mississippi valley.

But up to 1900, this work had, with one or two exceptions, been carried on under the old system of exploration, that is, shaft sinking and trenching, and most of the "good" mounds had been dug into and messed over. As would naturally be expected, little information of real value was obtained by these methods. About the beginning of the present century or a little before, more thorough and more scientific methods of mound exploration were brought into use. Pioneers in this work were Dr. F. W. Putman, of Harvard university, and Dr. William C. Mills, of Columbus, Ohio.

"The mounds of Ohio, we have found, were erected as monuments to the dead," declared Mr. Mills. "In them were placed the bodies of prominent individuals of the tribes to whom special honors were paid. With the remains were placed objects of stone, bone, shell and copper that were used as implements or ornaments."



Map of the Great Serpent Mound and Two Smaller Ones, Showing the Coils and Undulations of the Huge Earthwork

Some of the mound builders were adepts in the working of copper into beautiful objects. They possessed rich pearls, wove beautiful fabrics, made artistic objects of bone, stone and shell and carried out elaborate ceremonies in connection with the burial of their dead. Some cremated the dead and showered upon the remains the most precious of their possessions. One famous grave found in an Ohio mound recently revealed a burial of four mound-builder "princes," lying in beds of pearls and covered with finely woven fabrics bearing the most artistic designs.

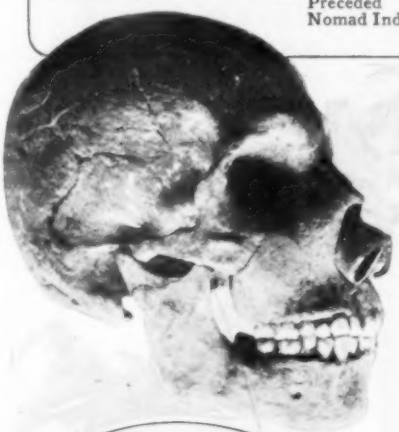
Among the more advanced of these ancients, copper was the "precious" metal which was worked up into art objects of rare design and execution. Silver was used in lesser amounts. In addition, they made use of materials from all over the United States and traded or bartered for stone, bone and shell.

"The Ohio Indian or mound builder," says Mr. Mills, "was never any more intent on doing the unnecessary than we are today. Having a suspicion of this, we early doubted whether the mounds that had been examined previously and reported unproductive had been explored thoroughly. We always were inclined to feel that the Indian would not go to all that work of piling up a big heap of dirt over nothing at all.

"One of the first mounds we explored was of small size. In this we began at the edge and moved the entire structure, but we did not find a trace of a burial. When we got all through, the boys asked what we were going to do about it, and I said that we would start right in and go through it again. But this time we went down a little bit deeper, and we

The Seip Mound, in Ross County, Ohio, Showing Graves Which Have Been Uncovered by Shoveling Away Successive Layers of the Earth That Had Been Heaped over Them Long Ago

Eagle Pipe, Above, Showing High Degree of Art Developed by the Original Settlers Who Preceded the Nomad Indians



Dr. W. C. Mills, Above, Director of the Ohio Archæological and Historical Museum, Examining a Specimen of Ancient Pottery Recovered from One of the Burial Mounds Which Are Now Being Investigated by the State

Artificial Noses, Made of Copper, Are Sometimes Found Added to the Skulls in the Burial Mound, Apparently through a Post-Mortem Operation; the Skull at the Left Wears One of These Ornaments, the Purpose or Significance of Which Remains a Mystery; at the Left Is the Claw of an Eagle Sculptured in Mica, One of the Religious Ornaments Found in a Mound Builder's Grave; at the Right Is an Elaborate Effigy Pipe; the Prevalence of Smoking Pipes, Usually of Highly Sculptured Designs, Indicates That the American Indians Got the Tobacco Habit from the Far Earlier Civilization Which Their Nomad Tribes Displaced, Probably Several Centuries before the Arrival of the First White Men

discovered that we hadn't been on the base line the first time. The second exploration of the structure resulted in the finding of five skeletons, all placed in one grave on the original surface of the ground upon which the mound stood."

Although a great many new facts have been learned about the mound builder in recent years, much remains to be revealed. Modern explorers and scientific workers are as yet unable to tell where the mound builder came from and what happened to him. They are hoping that further discoveries may clear up these mysteries.

TATTOO EXPERTS FIND NEW DEMAND FOR THEIR ART

Like all other arts and crafts, tattooing must keep abreast of the times in order to survive. The day of sailor trade, with its mermaids, ships' anchors and dragons, is pretty well in the background, but a new field has been opened in applying a "permanent blush" to women's cheeks, according to an expert who has experimented in this line. The operation consists, simply, of pricking the tint under two layers of skin, which is accomplished with a fine needle actuated by an electric vibrator. The delicate shading required is a test of the operator's skill. Applying photographs to the body is another form of expert work. A single needle is employed, but in the coarser work of the old days, and to a certain extent even today, several needles soldered together and operated by a single vibrator. The inks used are harmless, being made for this purpose in Germany. The predominating colors in the old-time designs were reds, blues and greens, but today a great variety of shades has been achieved. Another profitable field for the tattoo artist, if he is an expert, is the removal of tattoo marks. This is a dangerous process, if not carefully handled, and leaves a scar. To remove the marks, an acid preparation is pricked into the design, which eats away the color. An odd turn of the trade is putting color in a dog's nose to make it a more promising bench-show entry. An

Applying Old-Time Tattoo Designs, and, at Right, a "Permanent Blush" to Young Woman's Cheek; This Work Requires a Delicate Touch and Discriminating Eye

animal may approach perfection in all other requirements, but a mottled nose may bar it from a prize ribbon. The nose can be made all one color by tattooing. For many years there has been a profitable business in tattooing identification marks on infants, as a protection against kidnaping and getting lost, and emblems of lodges and fraternal organizations in indelible tattoo are in demand. A large number of customers wish tattoo designs to cover up vaccination scars, moles or birthmarks, and a blemish is thus converted into a decorative asset. Some of the more complicated designs cost as much as $300, but the usual price is much less.

POISON CRYSTALS IN SAFE WALL TO FOIL ROBBERS

Volumes of poisonous gas are produced the moment a drill penetrates the steel in a safe a German inventor has devised to defeat robbers. Crystals of deadly chemicals are deposited between the walls in a bed of porous concrete and are converted into gas by heat from the drill or blowtorch. The crystals are a compound of chlorine, carbon monoxide and hydrocyanic acid and the fumes are said to be more deadly than any used during the war and will penetrate any mask yet invented.

VACUUM MOTOR LAWN MOWER SAVES TIME AND WORK

The blades of an electric lawn mower now on the market are so arranged that they are said to suck the grass against the cutting edges, thereby insuring a better trim. There are five rotary cutters and they turn at a speed of 5,000 revolutions per minute, power being supplied from an electric motor through a cord which may be attached to the ordinary 110-volt house current, either alternating or direct. The motor cuts a swath seventeen inches wide and the height of the cut may be adjusted.

French Artist Finishing Model of the Pantheon in Cork; Material Is Easily Worked from Slabs

MODEL OF PANTHEON IN CORK SHOWS ARTIST'S SKILL

Slabs of cork are the principal material used by a French artist in fashioning models and other decorative objects. It is kept moist so that it will be pliable, and a special knife is used in tracing the outlines on the slabs before cutting. A replica of the famous Paris Pantheon, shown here, is typical of the things made from cork. One of the advantages of the material, besides its softness, is that the grain gives the effect of age—a desirable quality in reproducing some structures.

"SUPER-FLAX SEED" DEVELOPED TO MAKE LINEN CHEAPER

Linen may become as cheap as cotton goods if experiments with a new flax seed introduced in Ireland produce the results that some of the most optimistic growers anticipate. It yields tow double the length of the ordinary variety and free from the troublesome sticky substances which necessitate expensive hand-cleaning methods. The new flax can be worked by machinery, it is said. Several hundred acres in Ulster and a tract in Somerset, England, are to be planted with the seed.

Protection from Chinese Bullets for Ships in Whangpoo River; the Rope Armor Is Draped on Vessel's Bridge

ARMOR OF ROPE GUARDS SHIP FROM CHINESE BULLETS

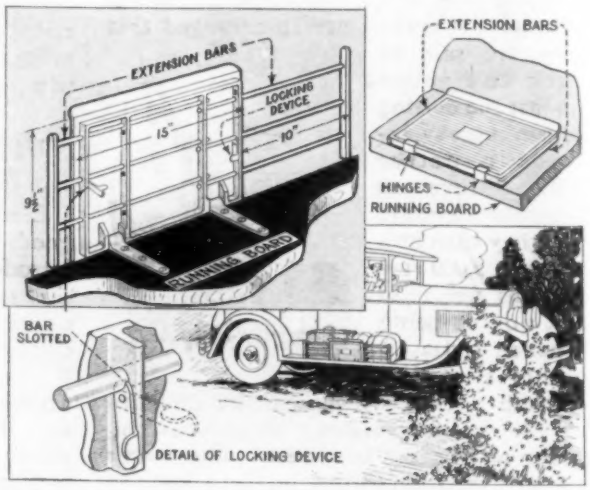
Heavy ropes and cable, draped over the sides of vessels on the Whangpoo river in China, proved effective in protecting the bridge against bullets during recent anti-foreign demonstrations. The "armor" was necessary because the ships were frequently exposed to fire while on the river.

WHO GAVE THE MONKEY WRENCH ITS NAME?

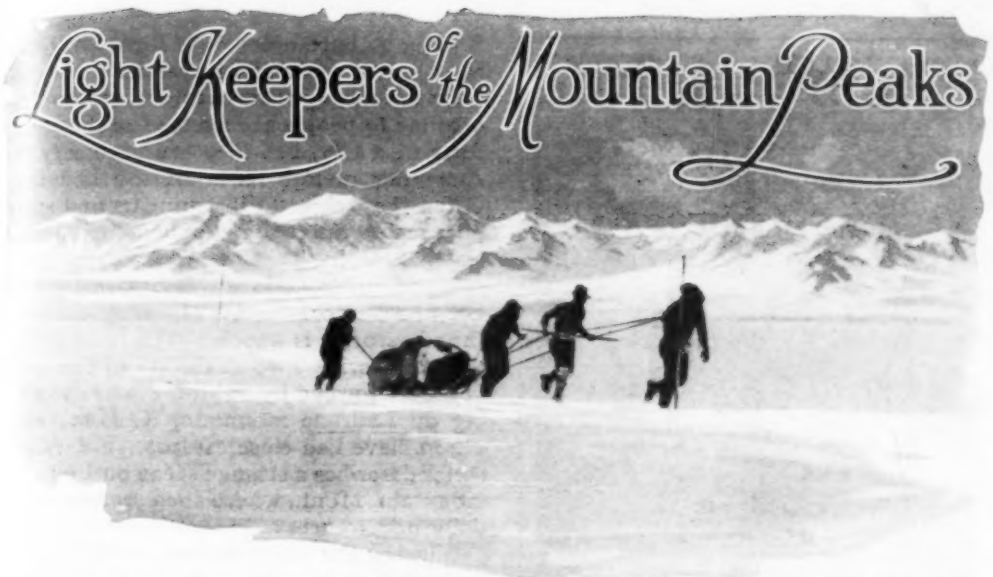
Where did the monkey wrench get its name? Some persons have held that it was named after its supposed inventor, James Monckey, but careful search of records has shown that no such name appears in the patent files of any country and the nearest approach is that of a Mr. Monk who was granted a patent for an improvement on pipe wrenches. But the term monkey wrench was used long before that. One plausible explanation is offered by a foundry proprietor in a letter written to a friend in 1865. He suggested that the wrench was probably so called because you "twisted its tail to make it open its mouth." Another misconception lies in the application of the name. Large buyers prefer the term "screw wrench," while in some sections, "spanner" is used.

CAR-STEP PLATE ALSO CARRIES LUGGAGE

A luggage carrier that folds up and becomes a step plate on the running board of the car is one of the latest novelties for motorists. Fully opened, it has a length of thirty-five inches, sufficient to hold two or three bags in place, while folded it is only fifteen inches long, and presents an aluminum and rubber tread for the passengers. The extension bars slide into the plate, which is hinged to the running board, and are held in place by a locking system.



Diagrams of the Luggage Carrier Folded and Extended, and in Use on Auto Running Board



Coast and Geodetic Survey Party Dragging Sledge Load of Equipment across a Glacier Bound for a Mountain Peak, from Which the Survey Light Will Shine Out at Night

Surveyors Who Operate Signal Lamps on Snowbound Summits Have One of the World's Most Lonely Jobs

By DONALD EDWARD KEYHOE

BLAZING into the night from a high Arizona peak shot a horizontal beam of light, its reflection silhouetting three figures beside a powerful electric lamp.

"Ten o'clock and no signal from Rogers," complained one of the men. "I wonder what's wrong. The others have been showing for an hour."

He indicated four specks of light gleaming like stars at distant points.

"Maybe it's too far to see him," ventured one of his companions, stooping to sight the lamp more accurately. "We're 153 miles from there."

For the fiftieth time the first man lifted his binoculars and stared into the darkness. After a minute he gave an exclamation of satisfaction. Another pinpoint of light had suddenly become visible. As he watched, it began a series of flashes.

"Send him a 'Z' and we'll get to work," he directed the man at the lamp. "We're late already."

He stepped back and swung his surveying theodolite toward the first of the far-off lights. As the lamp operator shielded the lens to start the code signal, the third man opened a recording book and poised his pencil, awaiting the first angle reading.

Four hours later, with lamp, batteries, and theodolite in back packs, the little party began its laborious descent of the mountain. Tired and hungry, the three men reached the base just at dawn and stowed their instruments in a waiting truck. A hasty breakfast and they were on their way to another peak.

Forced marches like this, with only a few hours of sleep snatched between long periods of climbing and observing, are not unusual in the operations of the coast and geodetic survey. They are generally the rule in mountain states, where short summers and smoke from forest fires greatly reduce the working time. Transportation in such regions is always a problem. William Mussetter, a geodetic engineer of the survey, tells of several difficulties encountered recently:

"At one place, on a single-track sidehill road in the northern California mountains, we came to a hairpin turn so sharp that we had to jack up the rear of our truck to get around. Another truck started to slide down a ravine and was stopped by a big tree, the only one for a hundred feet.

Signal Tower in the Philippines, Utilizing a Tree to Lift the Signal Light above the Jungle

"On the work between Salt Lake and Needles, Calif., our worst trouble was keeping enough water. While packing up a slope near Death Valley, where the temperature was 105 degrees early in the morning, six of us drank eight and one-half gallons of water in less than five hours. We observed at night and tried to sleep in the daytime, but it was usually too hot.

"We ran into cold weather, too, especially in mountain work. I remember we had to cross the Verde river several times when it was swollen by melting snow. Our boots filled up with sand and our socks would stay frozen all day, so we tried fording it barefooted. We got over all right, but it was chilly traveling."

Experiences of this nature may seem incredible to people accustomed to the comforts of a city, but they are necessary in surveying remote parts of the country. Often the weight of instruments and supplies makes the carrying of bedding impossible. Sleeping for three or four nights in scooped-out hollows on mountain tops is not at all uncommon. The frequency of thunderstorms is another feature of high-altitude work. Two engineers of the survey were burned by lightning while working on Ladrone mountain, N. Mex., and others have had close escapes. Mr. Mussetter describes a strange scene on Boulder mountain, Mont., where such storms were daily occurrences:

"During the most severe storm I heard a queer 'frying' noise outside the tent. Going out, I saw the tops of our steel poles glowing brightly from charges of electricity. And at the same time my hair began to lift and crackle. I wasn't any too comfortable, but luckily we weren't struck, though we saw near by spots that were.

"It isn't always serious work," Mr. Mussetter continues. "Funny things often happen. Once we were coming down a steep slope which was covered by snow with a hard crust. To keep from slipping, we had to dig in with our heels. The man behind me was a rather short chap, and in trying to walk in my steps he made a miscalculation. The first thing I heard was a rather indignant outburst and then this fellow slid by me at high speed, whirling around like a top in his efforts to stop himself. He brought up about 120 feet away against a heap of brush. He got up at once and began to dance around.

"'That's the first time I knew snow was hot!' he exclaimed, as I reached him.

"Another member of our party, who had not seen this, attempted to slide down a snowbank later on. He had seen others do it on a board, but rather thoughtlessly he chose a shovel. From his subsequent remarks I judged that he would not try it again for some time."

Sometimes peaks are not available for lights or observing stations. Signal towers must then be built or tall trees made to serve in their stead. Comm. E. H. Pagenhart of the coast and geodetic survey re-

Electric-Signal Lamp Set Up and Ready for the Keeper, Who Will Tend It on Many Lonely Nights on His Isolated Hilltop

[illegible] a thrilling experience he had while working in a 250-foot tree in the state of Washington:

"Using climbing irons and a safety belt, I started up the tree, which was nine feet in diameter at the base. At 130 feet, I had to discard the belt to get around the first limb. Then I worked on up, driving big spikes to be used as steps. When I reached the top I cut off about thirty-five feet of it so that a platform could be built. On descending I found the falling limb had knocked out some of my spikes. I had slung a line at the top, so I started to slide down on it. In a moment I loosened my hold and commenced to gain speed. Then I came to the spikes. The first one whizzed by uncomfortably close. I made a grab at the next one or two but missed. Finally I managed to slow down and get a tight hold on a small limb. And I stayed there several minutes, getting my breath back.

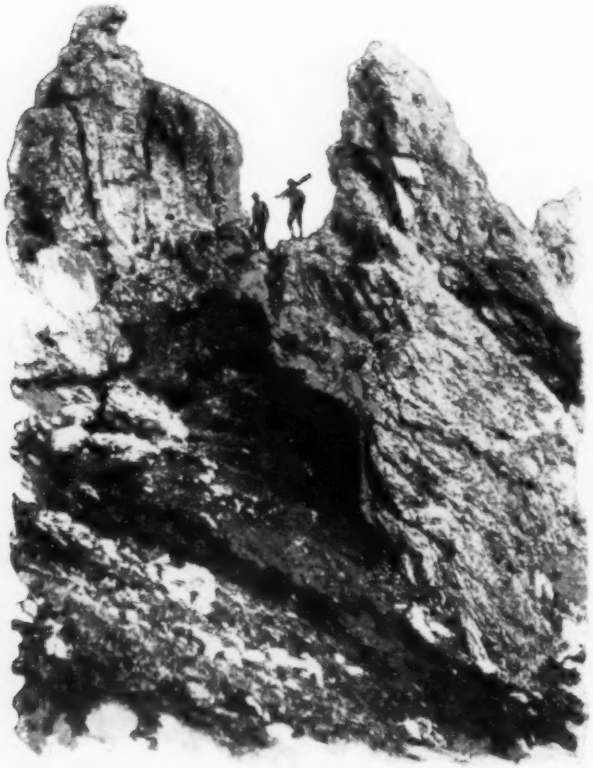
"We were at that station three weeks. Every night a lightkeeper had to climb up there in the dark, show his light three or four hours and climb back down. He said his biggest fear was going to sleep on the platform and rolling off."

Comm. Pagenhart had put in the spikes at intervals equal to the distance he could step, which was unusually long, as he was a tall man. The lightkeeper working with him was also tall. However, the officer who followed a few months later was somewhat shorter. His monthly report contained this paragraph:

"I earnestly recommend that the man selected to put in spikes after this be the smallest man in the party."

In few stories of the survey is there any mention of the lightkeepers, and yet they form a vital part of its geodetic work. Like their lonely brothers in lighthouses, they live a hermitlike existence, sometimes going days without seeing a human being. Night after night, their lamp shines from some isolated peak, its only answer a brief signal from the observer. Often there is no answer, as the observer is short-handed and cannot spare the time. But the lightkeeper must show his light regardless of whether he gets an answer or not.

Few men can stand such a desolate life for long, and many who try it "burn out" quickly. Yet there are several who have spent years in faithful service, taking blizzards, lightning, back-packing and other trials as part of the day's work. Seldom has a lightkeeper failed in his important duty, and then only for good reasons.



Engineers Climbing an Almost Vertical Cliff on the Boundary Line between Alaska and Canada, to Found a Lighthouse

Lieut. C. M. Durgin explains two of these rare instances:

"For two nights," he says, "we had missed a signal from a veteran lightkeeper named Wakefield. At last the officer in charge made a hurried trip to find the cause. It turned out that a large bear had taken possession of Wakefield's camp and had chased him off the peak. At another time, while observing on a light thirty miles away, we signaled the keeper for the time. He read 'Time' (— . . — — .) to be 'DG' (— . . — — .), which means 'Done at this station. Pack up and go to next one.' He didn't waste any time, but started at once, while we were fuming because the light went out. We didn't find out until the next day what was wrong.

"Montana seems to be an unlucky place for lightkeepers. One fellow came back to camp, after rustling some food, in time to see most of the camp destroyed by lightning. He fixed it up as well as he could, leaving his supplies while he went after limbs for shelter poles. When he got back, the lightning had burned the rest of his camp and also his food. He's one man you don't want to tell 'lightning never strikes twice in the same place.'

"Another chap, William E. Black, of Idaho, was sent up on Neihart mountain, Mont., late in the fall. He stuck out three days and nights in a heavy blizzard, without even an encouraging signal from his observer. Seeing he couldn't communicate, he abandoned his station, packing his lamp, batteries, and full camp equipment on his back. In going down he had a bad fall that started a stitch in his side. When he reached the village of Neihart, after staggering through miles of blinding sleet and cutting his way through undergrowth with an ax, they found he had a broken rib. Many a man would have dropped his pack rather than suffer like that, but Black never thought of it."

The opposite kind of lightkeeper, who never lasts long with the survey, is described by Comm. Pagenhart:

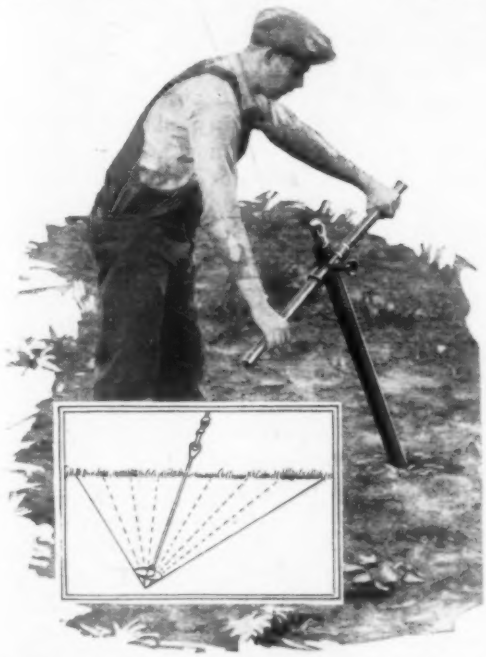
"I had hired a new man at a village and had spent all afternoon explaining his duties to him. Then my recorder and I started for the observing station, twenty miles away. I told the lightkeeper, if he had any trouble, to tell my wife, who was staying at a house near by, and who understood the principles of the work. The recorder and I reached the station at dusk and started observing. At nine o'clock the light went out. I was airing my opinion of the keeper when it came on again and began to flicker. Knowing the man didn't understand the code, I paid no attention but continued to observe in spite of the unsteady light. We finished at last and drove back to the village. My remarks concerning the intelligence of the lightkeeper were interrupted by my wife, who explained that she had been sending me a message. Earlier in the evening she had sent a man to see how the new keeper was getting on. All he had found was a dark lamp, with a note which ran: 'Life is too short.'"

ELECTRIC LIGHTS AS BUG TRAPS GUARD RICE FIELDS

Electric lights suspended over vats of water are used successfully in Japan to trap insects that damage the rice plants. Attracted by the glow of the lamps, the bugs strike the bulbs and drop into the water. About one trap to each two and one-half acres is effective and while the method does not kill all the insects, it reduces their number materially.

POST THAT SCREWS IN GROUND SAVES DIGGING HOLES

Anchorages for guy ropes and other purposes are quickly set without having to dig holes by means of a unit which is screwed into place. An auger head on the end of the bar is twisted into almost any kind of soil, from five to fifteen minutes being sufficient for installing it with two men working. In very hard areas, it is sometimes necessary to bore a small pilot hole first. The anchor is so designed that the weight of hundreds of cubic feet of earth around it is brought into play in helping to hold the shaft in position under strain.



Setting the Anchor, and Diagram Showing How It Grips Wide Area When in Place

Advertising a Town's Leading Industry, the Huge Chair at Thomasville, N. C.

HUGE CHAIR MONUMENT BOOSTS TOWN'S INDUSTRY

Thomasville, N. C., is one of the largest chair-manufacturing towns in the country, and, to advertise the fact, a giant seat has been erected on a pedestal in a conspicuous part of the city. It is thirteen feet high, the front legs are six feet tall and the seat slants to five and one-half feet at the rear. The chair contains sufficient lumber to make 100 of the ordinary kind and a week's time was required to build it.

"BREATH CURRENT" GIVES ALARM TO FOIL BURGLARS

Wood, paper, glass and other materials generally used for insulation can be employed as current conductors in operating burglar alarms and other units, a Berlin engineer has demonstrated. The apparatus functions on less than one ten-millionth of an ampere through a sensitive relay of wood. Merely touching objects guarded by the alarm actuates the signal, it was shown, while the "breath currents" of electricity spread over walls and curtains touching the things protected.

Bed Folded in Knapsack for Carrying, and Extended; Note How Sleeper Is Raised from the Ground

BED FOLDS UP AS KNAPSACK FOR HIKERS' COMFORT

For outing trips, a folding bed is carried as a knapsack and, when in use, keeps the occupant off the ground. It is made of rainproof canvas and the small metal parts necessary are of duralumin and weigh a little over three pounds. It offers an elastic and comfortable resting place and can be securely adjusted so that it will not sag down and touch the ground. In the home it may be used as an emergency bedstead.

MILK IS TREATED WITH STEAM TO PREVENT SOURING

By blowing steam through fresh milk and cream, a Wisconsin dairy expert has discovered a process for keeping them fresh. Milk thus treated was exposed to direct sunlight and kept at a temperature of seventy degrees for three weeks without souring, according to reports. The effectivity of the treatment is said to lie in the fact that the steam kills the bacteria and eliminates the acid that normally cause milk and cream to spoil.

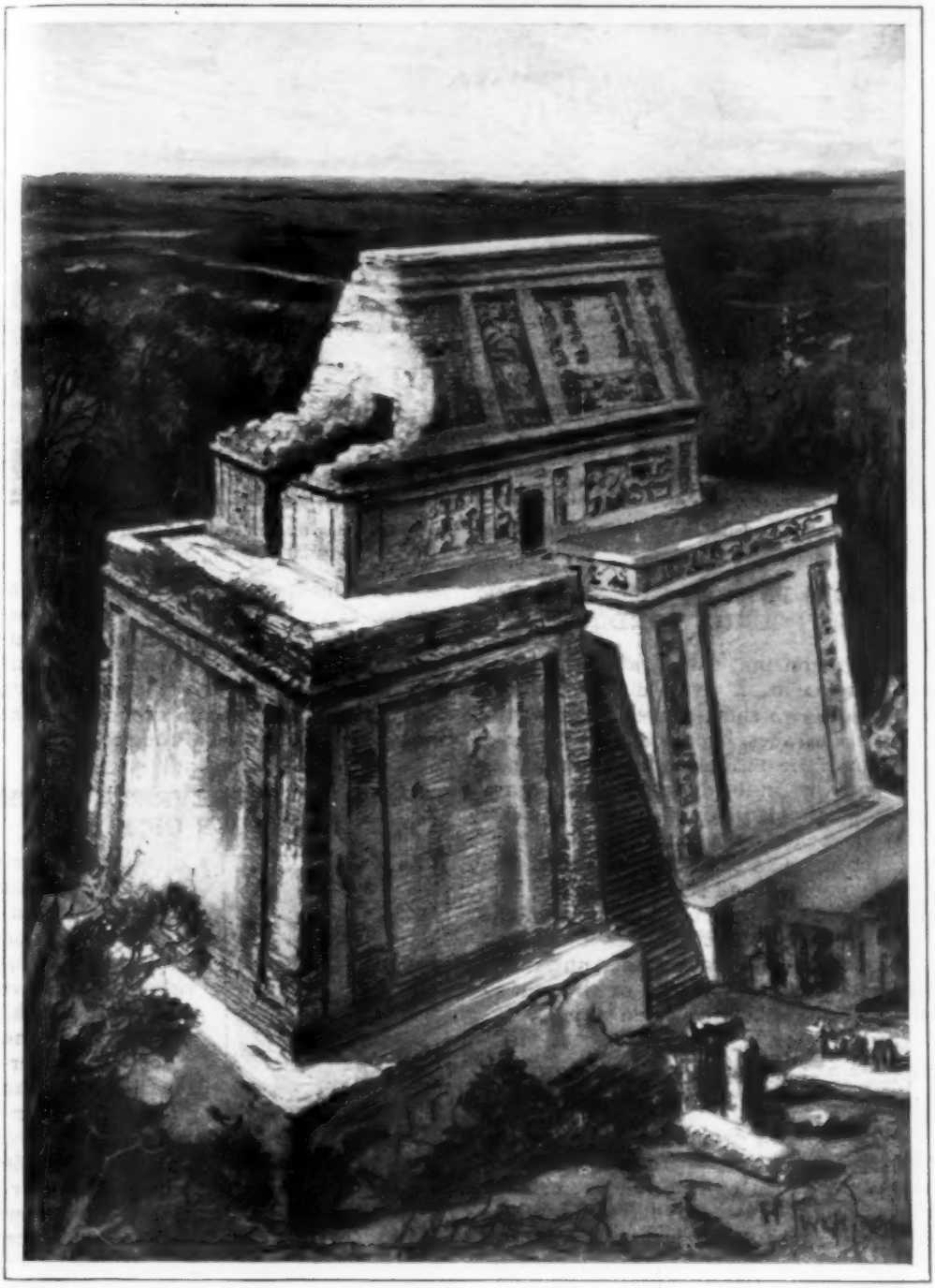
HOSPITAL FOR SEA GIVES SERVICE TO U. S. FLEET

One of the most important units of the navy is the hospital ship "Relief," the first vessel in the world built from the keel up for naval hospital purposes. Besides having every modern device for the safety, comfort and care of the sick and wounded, it is fitted as a fleet medical depot to fill the requisitions for emergency supplies from the other ships, and carries materials for a field hospital in case there is need of such a unit by a landing party. The ship has twenty-nine officers, 324 enlisted men, is 483 feet long and of about 9,800 tons' displacement. During maneuvers, the "Relief" usually occupies a position in the rear of the fleet formation. Patients seriously ill or injured are lifted aboard on special stretchers, the gangway platform being built extra large to accommodate such equipment, and are quickly taken to operating rooms, wards or special-treatment quarters. Berths in the wards are detachable and accessible from both sides.

BACKLASH IN CASTING ENDED BY WINDING LEVELER

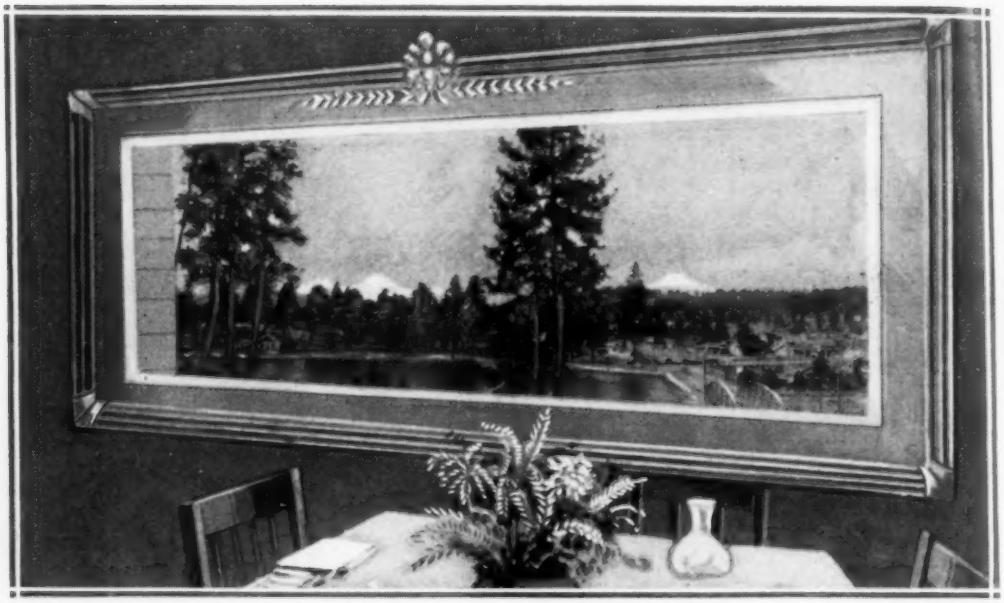
Adjustable to spools of different width, a winding attachment for the fishing rod is said to enable the fisherman to get a crisscross wind on the reel and thus prevent backlash in casting. It is fixed with two small screws and may be taken off quickly and easily when not wanted.

MYSTERY TEMPLE IS FOUND IN YUCATAN JUNGLE



Courtesy The Sphere

Ruins of One of Several Hitherto Unknown Temples Recently Discovered in the Yucatan Jungles; Some Are Nearly 200 Feet High, Bear Dates of About 400 B. C., Are Covered with Stucco Brightly Painted and Are Remarkable for the Narrow, Three-Foot Rooms at the Top



Window Casing Designed to Frame an Outdoor View; You Are Looking through the Wall of an Oregon Inn upon an Actual Panorama of Forests and Mountains

WINDOW FRAMES THE PICTURE OF SCENIC WONDERS

An Oregon inn, with a matchless view of Douglas fir, a river, distant wooded slopes and two snow-capped peaks of the Oregon Cascades, known as "The Sisters," capitalized the outlook by installing a "picture window" in the dining room. A heavy gold frame replaces the usual window casing and incloses the panorama of distant mountains. The Sisters recently attracted attention when land surveyors of the forestry service discovered that between the two peaks was a "lost" half section of land which by accident had remained unclaimed and uncharted on the map of Oregon, so that officially it belongs to no state.

PORTABLE CANVAS SNOW FENCE SUBSTITUTE FOR BOARDS

To keep snow from drifting upon the highways, a light, waterproof canvas fence has been devised by a Maine man to replace unsightly wooden barriers. When not in use, it can be rolled up and stored away. The canvas strips are attached to iron rods which are driven into the ground at intervals of ten feet. The strips are six inches wide and are spaced to form a fence four feet high, using but four lengths of canvas. The rods are long enough so that the lower strip can be removed and attached to the top if desired, making a barrier six feet high. When the wind blows, the strips sway back and forth, causing the snow to drift away from the road.

SAFETY LAMP PREVENTS SHOCK AND DANGER OF FIRE

Especially suited for use around the home or in garages, an extension electric light provides safety to the user, as both the socket and the wires are rubber-covered and the guard is fully insulated from the socket. A flexible handle is also furnished. Another electric unit for safety and convenience is a protector, which is easily adjusted and guards the plug from injury when it is dragged along the floor or bumped into objects.

RECORD FLIGHTS WITH GLIDERS MADE IN GERMANY

German flyers have been conducting many experiments with gliders recently, the results assuring experts that these motorless planes have possibilities of considerable usefulness. One aviator skimmed down from the crest of the Zugspitze to the valley of Ehrwald, 10,000 feet below, not long ago, making the ten-mile distance in twenty-five minutes and establishing a record for glider flights from such an altitude. A few day later, another flyer remained in the air for fourteen hours and eight minutes on a glider.

BIG PIPE SWUNG FROM CABLE DEFIES COAST STORM

During a severe storm, a 100-foot section of the twenty-eight-inch riveted-steel pipe line that supplies San Diego, Calif., with 5,000,000 gallons of water daily, was completely undermined and left without support. Engineers expected that it would break or at least leak, but it held securely. Temporary frames were quickly erected at either end of the stranded section, a cable was stretched between them and vertical lines tied to it, then under and around the pipe to decrease the strain. This held until a permanent support could be made.

Sling Suspenders for the Pipe Line; It Failed to Break Although Unsupported for Some Time

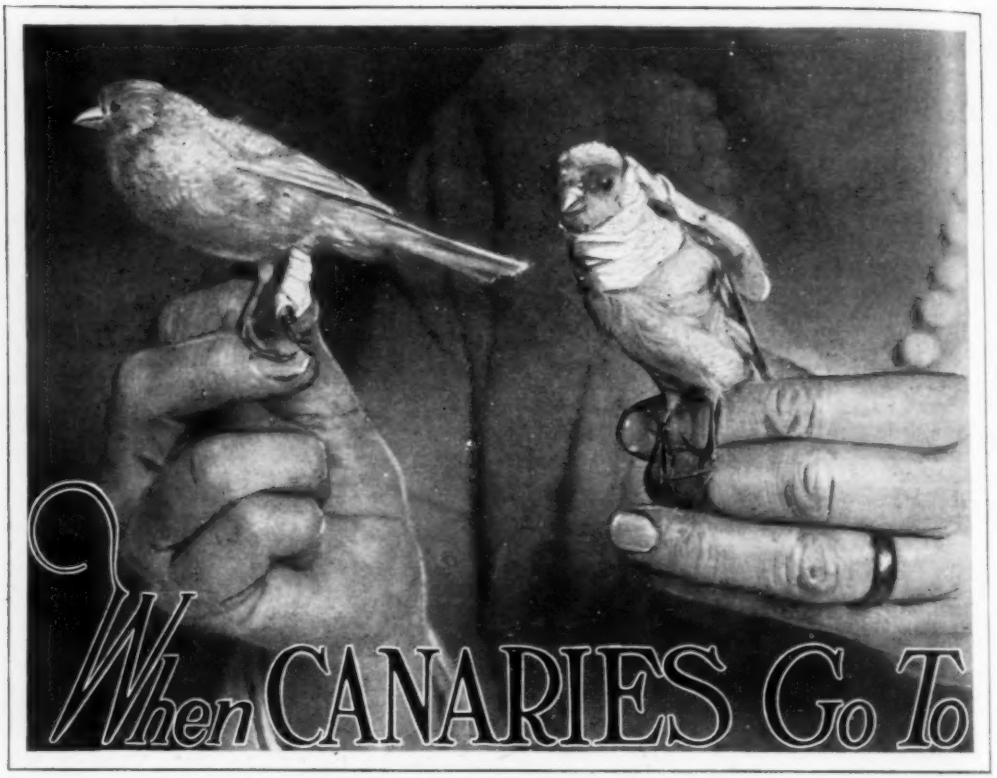
Demonstrating the "Wooden Ear"; Vibrations from Phonograph Record Carried to Teeth through Stick

HEARING THROUGH THE TEETH POSSIBLE WITH STICK

Persons afflicted with poor hearing through some defect in the outer ear, can often distinguish sounds clearly when they are transmitted through the bones of the face. This is illustrated in the unit shown here, invented by a Florida man to enable the deaf to enjoy phonograph records. It is essentially a wooden holder with a phonograph needle in one end. The other is inserted between the teeth. The vibrations are communicated through the stick, thence to the ear through the bones.

FREE SUN BATH IS ALLOWED BY PERMEABLE CLOTHING

Without change of appearance or durability, cloth is treated by a method a British scientist has discovered, so that it allows the healthful ultra-violet rays of the sun to pass through and reach the skin. The way for "free sun-bath treatments" was discovered during the course of some X-ray experiments.



By PAUL PADDOCK

CANARIES are like parrots, they learn by imitation, hence their early instruction is of importance, for most of their singing ability is acquired while they are very young. Not many learn a great deal after they are a year old. Females seldom sing, but if your male canary doesn't do anything but chirp, its early schooling was probably neglected, or it grew up in the wrong company.

A visitor at Stulik's canary farm, close to Chicago, where from 500 to 4,000 pets are housed in one of the largest aviaries of its kind in the world, soon learns that a singing canary is about as temperamental as other "stars," that it is subject to sore throat and other ills that afflict human performers, gets jealous and angry at its rivals, is exceedingly self-centered and requires weeks of careful instruction with expert bird teachers and special instruments before it learns its songs. At this institution is a large flying cage where the birds get exercise after they are eighteen to twenty-two days old, a boarding house, rooms for breeding cages, and a theater where the singing "pupils" may perform for visitors. It all grew out of a hobby Mr. Stulik started twenty years ago.

Four or five months after the birds are hatched the males are caged in the singing department. Two or three star performers are kept close to them so that they will hear desirable notes at all times and will not learn to imitate the chirping of the females. Each bird is kept partitioned from the next stack of cages, and the entire singing class is curtained off part of the time each day.

Bird raisers use violins, flutes, whistles and many other instruments in teaching their pets, but one of the most interesting aids is the organ. It is operated by weights on a chain and produces three distinct sounds, a whistle, a rapid staccato bass note and a call like that of a cuckoo. As the weight falls, it pumps small bellows which supply air to the proper chambers to make the sounds. It runs forty-five minutes before the weight must be read-

Canaries Recuperating in Bird Hospital, and a Class of Tricksters Training for the Stage

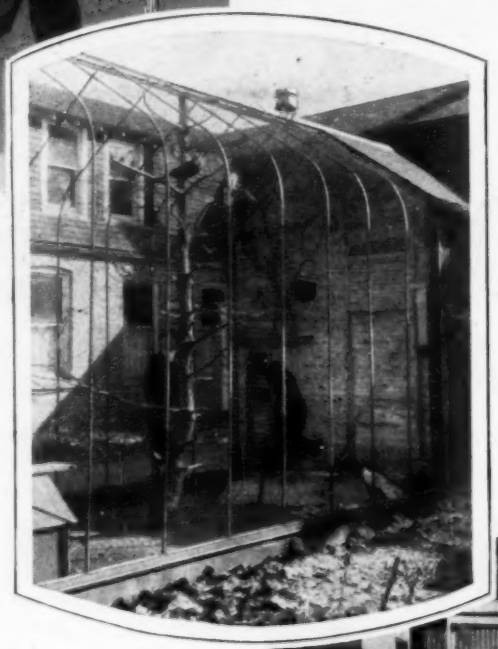
SCHOOL

justed. How rapidly the bird will learn and how fine its song will be, depend to a large degree upon its breeding and its own peculiarities. It may develop into a genius such as "Yankee," the famous California bird that whistles a number of tunes and is a favorite radio entertainer.

Bird fanciers in England quite recently mourned the death of a remarkable roller canary. The name "roller" describes the soft, rolling notes these birds produce as compared with the sharp, halting ones of ordinary kinds. This particular bird was able to make sixteen different notes a second. It died before another canary could be taught to imitate the song, which is now regarded as the "lost chord" of the bird world. Few canaries can make more than ten notes a second.

In picking a canary from a bird store, some prefer imported ones, but authorities declare that no one country now has any monopoly on fine singing canaries. Of the 500,000 live birds shipped into the United States in 1925, the majority were canaries, and it is not unusual for a steamer to carry 1,000 or more in one shipment for sale here. Last year, a New York department store sold 18,000 canaries and more than 5,000 love birds, besides hundreds of other kinds. Each year, it takes more than 12,000,000 pounds of imported canary seed to keep the bird pets in American homes well and singing. The increasing popularity of the birds is partly due to the fact that so little time is required to tend them. Five minutes a day is enough if careful attention is given to the diet. Originally a native of the Azores, the Canary and other small islands off the east coast of Africa, the bird has become adapted to less tropical climates and but little resembles the wild varieties in plumage or song.

Many bird owners make the mistake of giving their canary too much sunlight and keeping it too warm. Since the beginning of the sixteenth century the bird has been



How the Singing "Pupils" Are Kept Covered and the Cages Separated with Paper Partitions; an Outdoor Cage at Stulik's Farm, and the Bird Organ Being Adjusted for Operation

a household pet and has become accustomed to indoor life, but it is less delicate than many persons suppose. Last winter one of Stulik's canaries was kept in an outdoor cage all season and apparently was comfortable when the temperature was seventeen degrees below zero. This treatment is not recommended for all birds, but they do not need and should not have constant coddling, authorities declare. Keep the cage in the coolest part of the house in the summer, and in winter where there is likely to be the most even temperature. The bird should not be exposed to direct sunlight nor placed near a window. The cage should not hang too close to the ceiling. Most of the air currents are more pronounced at the top of a room so that there is danger of a draft if too high. On the other hand, the cage should not be under six feet from the floor.

The canary is a voracious eater. One owner reported that his bird ate thirty times its own weight in seeds and other food in one month. This was probably a case of improper feeding, but many persons make the mistake of giving their pets too much. The bird should always have cuttle bone, some kind of fine gravel to help to digest its food, and a plentiful supply of drinking water. The diet depends to some extent upon the bird itself, and owners are advised to study their pets and find out what kinds of food produce the best results. A first essential is good canary seed and rape seed. Celery, cabbage, apple, green pepper, dandelion, chickweed, raw carrot and lettuce are all suitable extras, although many experts agree that a common mistake is to give the canary too much of the latter vegetable Hemp seed should be given as an extra and not as a steady item of diet. A daily feed of hard-boiled egg with crackers is given to advantage, especially during the breeding season.

Feeding and Watering Time at the Canary "Farm"; Rations Are Carefully Measured According to the Bird's Appetite; Don't Overfeed Your Pet, the Experts Advise

Canaries are subject to a dozen or more common ailments, some of which need expert treatment. One of the chief troubles is colds, often caused by exposing the bird to drafts, giving ice-cold drinking water, forced cold baths or too sudden change in temperature. A cold may also explain why the canary no longer sings. A drop or two of olive oil down the bird's throat, taking care not to get any on the feathers, a small piece of rock candy in the drinking water and a bit of smoked fat bacon, within easy reach between the bars of the cage, may help restore the bird's voice. Frequently inferior seed is responsible for loss of voice. It may also be stimulated to sing by placing it where it can hear the song of other birds, or musical instruments.

With proper care, canaries often live to be twelve or sixteen years old, and sometimes longer. In selecting from a bird store, the young ones can often be distinguished from the older birds by their feet and legs, which are smooth and of fine texture under the age of a year or so. The more mature birds have coarse and scaly legs. Experts are fooled many times in distinguishing a male from a female, but, in general, the male birds have broader heads, flatter on the crown, the body is more slender, the eyes are brighter and more bold-looking and color patches on the back are usually of darker hue than those on the female. The male swells its throat when singing and produces a longer, more connected song.

BRACE TO KEEP HATS IN SHAPE HIDDEN UNDER SWEATBAND

Concealed under the sweatband, an adjustable brace is said to keep the crown of a soft hat in better shape as it prevents the front or back from caving in. The support is partly collapsible so that it may be fitted to hats of different sizes and does not interfere with the wearer when in place.

Matching the Washington Monument in Altitude; the New American Insurance Union Building in Columbus, Ohio

BUILDING RIVALS WASHINGTON MONUMENT IN HEIGHT

Built to the exact height of the Washington monument—555 feet five and a half inches, the new forty-eight story home of the American Insurance union in Columbus, Ohio, combines a theater seating 3,000 people, a 600-room hotel and an office building, all in one. The main tower rises at the corner of two streets, with wings flanking it on either side, while back of the tower and between the wings is the theater. An alley on one side is bridged to connect several floors to an adjoining hotel, giving a 600-room addition, and above the hotel is the office building. How much material is used in building a modern skyscraper, is indicated by some of the architect's figures. The concrete would build a sidewalk four inches thick, three feet wide and ninety-six miles long. Ten thousand tons of structural steel, if rolled into quarter-inch plates, would cover forty-six acres or make a seventy-five-foot roadway more than five miles in length. The 1,712 windows in the building, with 34,000 square feet of glass, equal the entire surface area of one side of the building. Three thousand doors, eighty miles of electric wiring, fifty miles of conduit, five miles of telephone wire, five acres of room carpets in the hotel section, two-thirds of a mile of corridor carpet and fifty-seven acres of plastering are some of the other things that are involved.

TRICYCLE TAXICAB CUTS COST

Three-wheeled taxicabs, recently introduced in Vienna, are said to be gaining favor, as they operate on reduced rates and make fast time. An additional advantage is that they take up less room than the larger cars and can be handled easily in crowded traffic.

Tricycle Taxicab for Rapid Service through Crowded Streets; Passengers Are Sheltered from Weather

SADDLE MAKING IS REVIVED AS ART IN FAR WEST

Carving Designs on Leg Fender; Upper Right, a Twenty-Five-Hundred-Dollar Saddle; Left, Standard Type and Elaborate Bits

Despite the passing of the horse-and-buggy days, the saddle business is picking up. While the movies are partly responsible for the revival of the saddler's art, a greater market has been opened by the wealthy sportsmen who have purchased large estates in California and also the "dude" ranches in Montana and elsewhere. Visiting easterners like all the western color they can get, and a handsome silver-mounted saddle is no small part of it. Some of the saddles, with bridle and equipment to match, sell for as high as $5,000 and require over a month to make. Frequently the buyer comes to Los Angeles to be "fitted," much as a man is measured for a suit of clothes. There is still a considerable market among the real cowboys, and the amount that these men of the plains will invest in a good saddle is surprising. Often its cost is equal to that of a serviceable car. Saddlery is really an art rather than a trade. Frank Moreno, one of the best-known saddlers in the west, has worked continuously at this craft for twenty-seven years, and his father before him, a California pioneer, spent all his active years in making saddles. From cutting down to fashioning the seat and fitting the rich trimmings, saddlery requires great skill. The leather carving in itself is a fine art, and all is done free-hand. Designing and engraving the silver plates and "conchos" is still another highly specialized art.

Lighting the Show Window with Outside Switch; Shoppers Learn to Turn It Off and Save Current

SWITCH OUTSIDE SHOW WINDOW SAVES ELECTRICITY

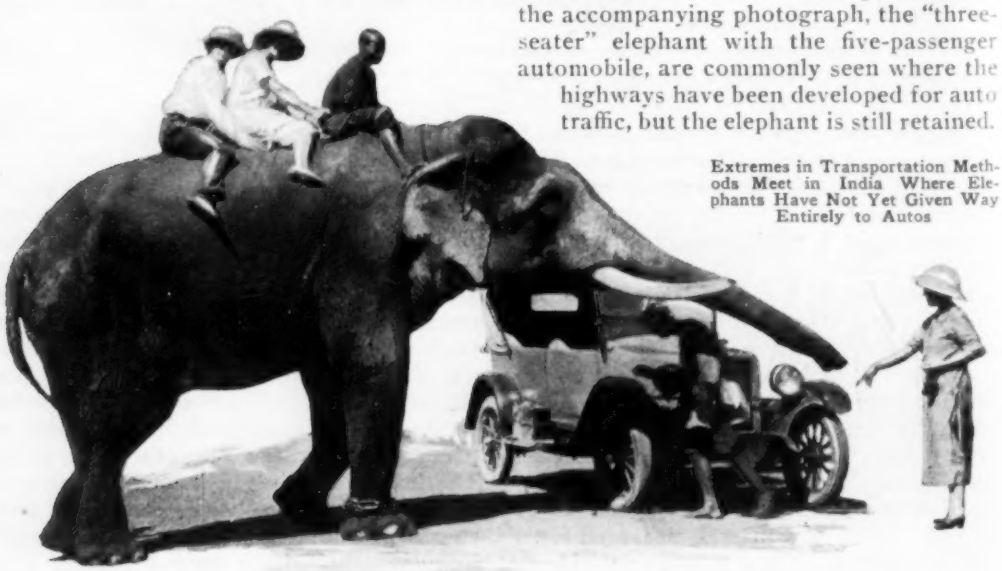
Instead of allowing the lights in his shop windows to burn for hours at a time after nightfall, a Berlin merchant has installed a switch on the outside, so that persons wishing to see the display can turn the lamps on. Although some go away without snapping them off again, many do so with the result that much less current is consumed.

CONTROL FOR SHIP PROPELLERS PREVENTS "RACING"

To prevent the racing of a vessel's propeller when the stern is out of water in a high sea, a control has been designed by a California inventor. It is intended to reduce shock and strain and to result in lower fuel consumption, especially in heavy weather. During a gale, when high seas are running, and the propeller is buried deep one moment and spinning like a windmill, high above the trough of the sea, the next, it is a frequent practice to have two or more men stationed at the throttle valve to meet the ship's motion by cutting down the steam pressure as the vessel rises and the water resistance against the blades is reduced to nothing, then opening the valve the next instant as the ship settles, in order to maintain headway. This method is not efficient and is supplanted in the automatic control which is essentially a weight on wheels that follows the motion of the vessel and actuates a geared valve, at the top of a pendulum, to open or close the steam as the vessel rises or settles.

EAST MEETS WEST IN TRAFFIC ON STREETS OF INDIA

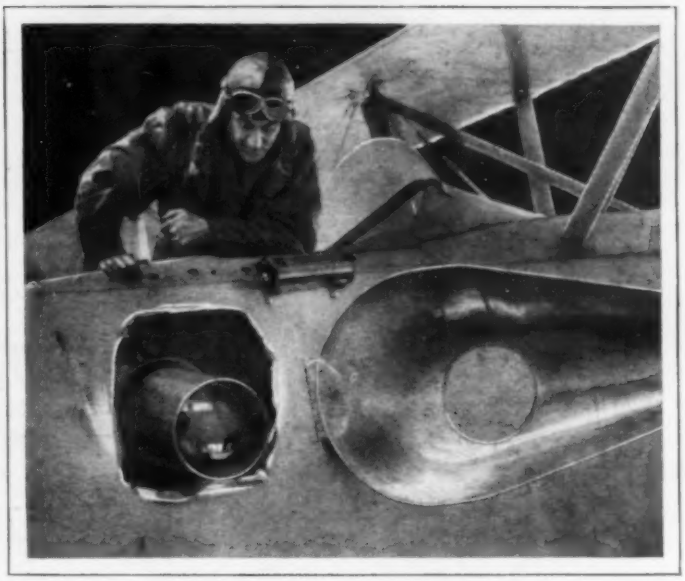
Although western modes of travel are rapidly being introduced in India, the elephant is still widely used for transportation. Contrasts such as that presented in the accompanying photograph, the "three-seater" elephant with the five-passenger automobile, are commonly seen where the highways have been developed for auto traffic, but the elephant is still retained.



Extremes in Transportation Methods Meet in India Where Elephants Have Not Yet Given Way Entirely to Autos

SUB CIRCLES GLOBE TO STUDY CRUST

Interesting observations of the earth's crust have been made by a Dutch scholar on a voyage rivaling in reality any described by Jules Verne, a submarine trip around the world. At certain places, the traveler was able to detect with comparative ease one of the phenomena known to scientists for some time, the difference in weight of the same objects at various points on the globe. Such measurements must be made with delicate instruments and are difficult on board a vessel, due to the motion. Inside the submarine, satisfactory results were obtained more easily as there was less interference. The difference in weight is believed to be caused by variations in the density of strata composing the crust of the globe.

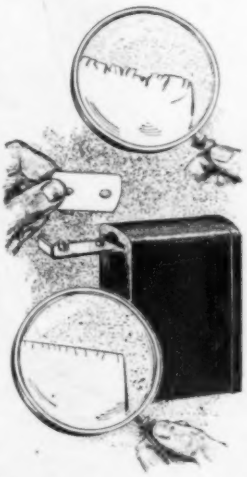


Camera "Cannon" to Take Pictures from Airplane at Range of 200 Miles; Special Ship Was Built to Use with It

CANNON-SIZED AERIAL CAMERA HAS 200-MILE RANGE

The biggest aerial camera ever built, with a nine-inch lens and a range of 200 miles or more, is to be tried out at Rochester, N. Y., this summer, taking long-distance pictures of New York city's famous sky line. The camera is so big that when it is thrust through a porthole in the side of an airplane, it looks like one of the ancient cannon of sailing-frigate days. Special filters will be employed to utilize the ultraviolet rays and penetrate clouds and mist. An airplane is being built for the camera, powered to fly higher than any aviator has yet been, so that pictures may be taken from a height of eight miles, at which the view would be between 300 and 400 miles.

MAGNET KEEPS SAFETY-RAZOR BLADES KEEN



The principle of magnetism has been adapted to sharpen and keep in good condition safety-razor blades, saving the trouble of stropping them. When dull, the blade is simply inserted in a little cabinet in which a magnet is so adjusted that it straightens the bent and ragged edge of the blade without any effort on the part of the user. The sharpener has no moving parts to get out of order, is suited to different kinds of safety blades and keeps the blades where they are easily accessible.

OIL IS EXTRACTED FROM COAL IN IMPROVED RETORT

Cheaper and quicker extraction of crude oil and gases from coal is promised with a special retort a South African inventor has devised. A distinguishing feature is an inside brush mechanism which is said to keep the contents agitated, hastening the reduction processes. Volatile matters are said to be vaporized within three minutes after the coal has been loaded into the retort, and oil is produced soon after.

Courtesy the Illustrated London News

Greyhound Racing after a Mechanical Hare Has Displaced Whippet Coursing in England, Where a Half Dozen Tracks Are Devoted to the Newest Sport from America; the Sketch Shows a Typical Scene during a Hurdle Race on the Oval at Manchester

Thrills in DOG RACING

Seven Tall and Speedy Greyhounds, Blanketed and on the Leash, Being Led Out for Their Race; the Dogs Are Paraded, Just as Are Horses, Before They Enter the Starting Box

TWO thousand powerful greyhounds, trained to the minute, are chasing electrically propelled stuffed rabbits around quarter-mile tracks all over the United States. Across the oceans, in Europe, South Africa and Australia, thousands of other blue-blooded canines are being raced in the latest of American sports, which already rivals the ancient pastime of horse racing in popularity.

Despite the fact that the game is hardly six years old, it has already taken a place as one of the most fascinating of sports. Crowds of 10,000 banked around the oval track are not unusual for the average evening program, all dog races being run at night under blazing electric lights.

To the late O. P. Smith, who, prior to his death a few months ago, was high commissioner of the International Greyhound Racing association, goes the credit for developing the chase of the electric rabbit. Mr. Smith developed his first crude mechanical rabbit as long ago as 1909, but it was not until ten years later that even fair success was attained, and public races really date from 1921. Despite its newness, the sport has spread throughout the world. England saw its first track at Birmingham last year, and this season has six. Canada had one last year and four this season. One has been built at Cape Town; Australia is constructing several and Mexico has applied for a franchise under the international association.

Track racing differs materially from the "society races" of whippet dogs. The little whippets, weighing from twenty to twenty-five pounds, are raced on a straightaway between cords which mark each dog's path. A trainer at one end of the course releases the dog, who runs to a trainer at the other end.

The track races use greyhounds, standing twenty-four inches or more in height and weighing up to as much as seventy-five pounds, though the best racing animals average from fifty to sixty pounds. On the oval course, with fairly sharp curves at either end, only slightly banked, the better dogs can negotiate the quarter mile in twenty-five seconds, a rate of thirty-six miles an hour, and to keep the electric rabbit ahead of them in shorter dashes, it is geared for a top speed of fifty miles an hour, though its average running speed is

Whippet Coursing in England, Where a Half Dozen Tracks Are Devoted to the Newest Sport from America; the Sketch Shows a Typical Scene during a Hurdle Race on the Oval at Manchester

limited to around forty to forty-five miles. Twenty-five horsepower and an electric car weighing more than 1,100 pounds are necessary to whisk about a pound of stuffed rabbit around the course at that rate. Years of work were concentrated in developing the car, the special electric motor and the housing, which hides car and track from the dogs, while permitting the arm carrying the rabbit to project over the track for about five feet.

The dogs know that the rabbit is a fake, and in the early days when power failures or mechanical trouble brought frequent breakdowns, it was not unusual for the dogs to catch the lure and bite the skin until their gums bled from contact with the metal lining, yet they would be out in the next race trying just as hard as ever.

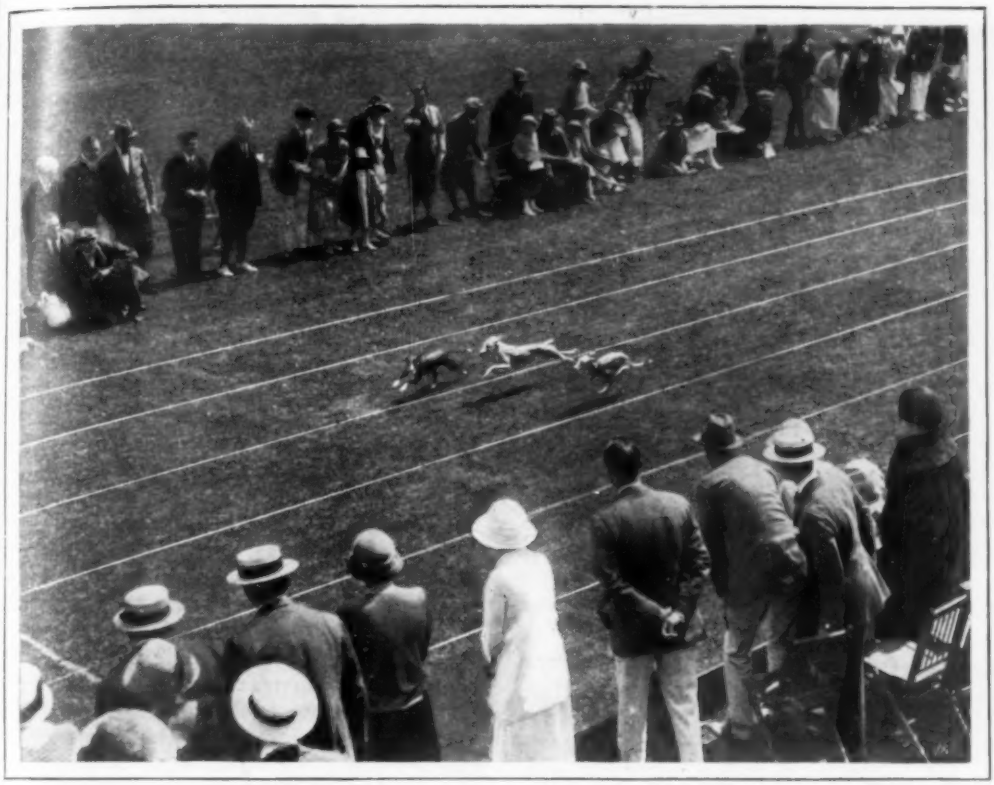
The greyhounds have learned to associate the rumble of the hidden car with the rabbit, and even when they cannot see the animal, will go wild with eagerness whenever they hear the mechanism start. For this reason the dog stables have to be kenneled away from the track, to keep the animals that are not racing from disturbing the peace. In the earlier days, after the rabbit escaped through a trapdoor at the end of the race and disappeared from sight, the car would keep on going for some distance under its own momentum, setting the dogs crazy in their eagerness to follow the noise. The difficulty was removed by the development of a special motor which utilizes an ingenious electric braking system to bring the car to a stop by the time the dogs have reached the hole through which the rabbit disappeared.

The quarter-mile dirt tracks, twenty-five feet wide and banked two and a half feet at the turns, have front and back stretches, 300 feet in length, and turns with a diameter of about 117 feet. The housing that hides the car and motor is on the outside of the track, with a slot running around its inner face through which the arm carrying the lure projects. A plank track, laid around the outside of the track, provides a runway for a small rubber-tired wheel supporting the arm, keeping the rabbit about five inches above the track.

An improvement which has just been patented makes the rabbit move up and down in a realistic way as it runs along, and the new rabbit has been provided with a squeal to supplement the dog's eyes. Greyhounds have very poor scent and race only by sight and ear. A live rabbit tied in a sack and placed under a dog's nose will not be bothered so long as it doesn't move.

Eight dogs are raced in each event, and eight races, seven flat ones and one hurdle, compose the usual evening program. Occasionally matched races between two, three or four dogs are arranged. Starting boxes with spring trapdoors, each box having eight separate compartments for the dogs, are used. The electric rabbit is

Trainers with a Group of Young Dogs Being Schooled to Chase the Electric Rabbit; the Narrow Track and the Wheel Are Eliminated in the Latest Models to Increase the Realism



The Society Game of Whippet Racing; the Dogs Are Much Smaller Than Greyhounds and Race on the Straightaway, between Tapes, Running from One Trainer at the Start to Another at the Finish

"spotted" at the other end of the track, just out of sight around a bend, and the dogs are placed in the starting box, which is run out on the track. The position of the box is twenty feet behind the starting line, where the clocker stands with his stop watch.

When the dogs are in place, the rabbit is started and run around the track to get up speed. As it passes the boxes, the dogs catch sight and give tongue. When the rabbit gets forty feet ahead, the starter drops his flag and the trapdoors are sprung, releasing the dogs. From then on the man at the controls in a tower, from which the entire track is visible, keeps the rabbit about sixty feet ahead of the foremost dog.

As soon as the animals start, the box is withdrawn from the track, and after the car has passed the right end of the front stretch, the operator in the control car throws a switch in the track so that, when the car gets around again, it will be sidetracked onto a switch track. A barrier is dropped across the track, containing a trapdoor through which the rabbit disappears. The barrier is 126 feet past the finish line and the dogs continue the chase until the lure vanishes. They rush up and sniff the door, and occasionally try to poke their heads through, but by the time they reach it, the electric brake has stopped the car and there is no sound to follow.

The greyhounds raced are all thoroughbreds. An untrained pup is worth as much as $300 or more, and trained dogs which have won a race bring from $1,000 up. The owner of the world's champion hurdler has refused an offer of $5,000 for his dog.

They are at their best when from two to three years old, though some pups have been raced at fifteen months. The average racer lasts for three or four years, though again there are exceptions, some dogs eight and nine years old still being able to go out and win a race occasionally.

One advantage over horse racing is the lower prices of the animals, the lower upkeep costs and the lower transportation

A Fine Specimen of Greyhound; No Particular Color Scheme Is Standard, the Thoroughbreds Being of Many Types

charges, for a dog in his traveling box can be carried by express for only a fraction of what it costs to ship a horse. Thirty-five cents a day will feed a racing greyhound. One meal a day, after the evening's race, is the usual fare. The most common diet is seventy per cent fresh-ground hamburger, mixed with crumbled dog biscuit or crumbs of very dry bread. Some of the western dog raisers have had success in feeding their animals specially cooked Irish stews.

While one meal a day is the rule, some of the trainers, who had experience in Irish coursing before taking up track racing, have introduced an unusual novelty by giving their dogs a cup of very black coffee each morning. The animals take to the coffee and the trainers claim that it not only gives them strength and speed, but helps them get through the day on an empty stomach.

One of the things that make dog racing attractive for the spectator is the fact that the dogs run their own race, without control or guidance, which obviates any chance for "pulling" a mount, as has been done in horse racing. Like every other sport in which money changes hands, many attempts have been made to fix or throw races, usually by tampering with the dogs' food. Besides outlawing trainers who were caught in attempting frauds, the governing association, which supplies all the race officials for each track, has adopted elaborate precautions to defeat crookedness.

The most important is the fixing of a racing weight for each dog. The owner is allowed two weeks to experiment with a new dog, after which he must declare the weight at which he believes his animal performs to the best advantage. Thereafter, until a new weight has been declared as the dog grows, the animal must be kept within a half pound over or under the de-

The Start of the Race, Just After the Dogs Have Been Released from the Starting Box to Chase the Electric Rabbit, Which Is Sixty Feet Ahead and Near the Outer Edge of the Track

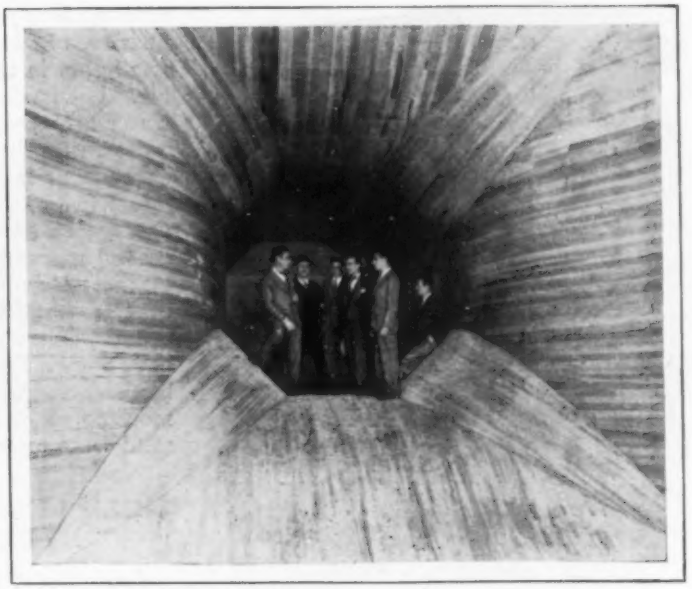
clated size. The dogs are weighed in at six o'clock in the evening on which they are to race, and if outside the limit, are barred for the evening. After weighing in all the dogs for the eight races, all pass from the owners' control into that of an association kennelmaster, who does not surrender them again until fifteen minutes before race time, when they are weighed again, and the slightest variation from the earlier weight will cause the dog to be ruled out.

Handlers working under the association lead the dogs in the parade before the grandstand, each dog wearing a muzzle and a small blanket bearing his colors and number. The muzzles and blankets are worn throughout the race, the former being necessary to prevent a general fight after the rabbit disappears.

Positions are drawn by lot, and, though the rabbit is only five feet from the outer edge of the track—to keep it in view of the dogs when rounding the turns—the animals quickly learn that the inside rail is the shortest way around the oval. After four or five starts, the average dog has mastered that fact and, if it draws an outer position, will always try to break over to the rail as soon as it is released.

Experiments with other breeds of dogs, notably wolfhounds, have been complete failures, because they either haven't the heart to keep on after another dog passes them, or because, as is the case with wolfhounds, the animals are accustomed to running in pack formation and will follow a chosen leader without attempting to pass him. The greyhounds, on the other hand, are all individualists, striving to be first.

All of the dogs are raced in flat races, but not all can be trained as hurdlers, which makes the good jumpers the more valuable. Four hurdles are used, the first two and a half feet high and each successive one two inches higher, so that the final hurdle is three feet above the track.

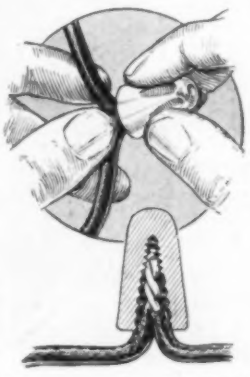


To Illustrate the Size of the Airplane-Testing Tunnel; Group of Men at One End of the Shaft

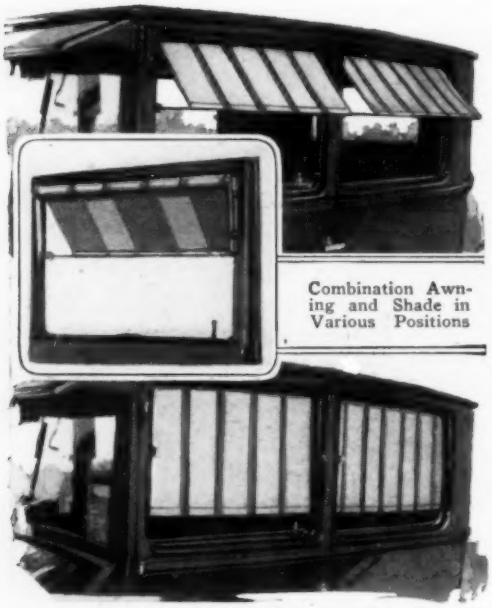
HUNDRED-FOOT TUNNEL HELPS IN STUDYING AIRPLANE

Exact scale models of airplanes are flown inside an air tunnel, 100 feet long, at the aeronautical school of New York university, to study their reaction to blasts of air from a huge propeller. The shaft is nine feet in diameter at the working end, and air can be blown through it at the rate of 100 miles an hour.

CONNECTOR FOR ELECTRIC WIRE REPLACES SOLDERING



To join electric wires, a porcelain unit, threaded on the inside, takes the place of soldering and taping. It is only necessary to push back the insulation on the wires, insert the loose ends in the cup-shaped connector and twist. The screwing-up action binds the wires together and forces them into the cup as a nut is screwed on a bolt.



Combination Awning and Shade in Various Positions

AUTO AWNING AND SHADE IN ONE RUNS ON SPRING ROLLER

Easily installed on any model of closed car, a combination awning and curtain is intended to increase driving comfort without detracting from the appearance of the auto. It does not interfere with raising or lowering of the glass and has a strong spring roller that fits neatly on the inside of the window frame. To convert the shade into an awning, a steel rod is simply raised into position either in or out of the car. When not in use, the protector rolls up entirely out of the way.

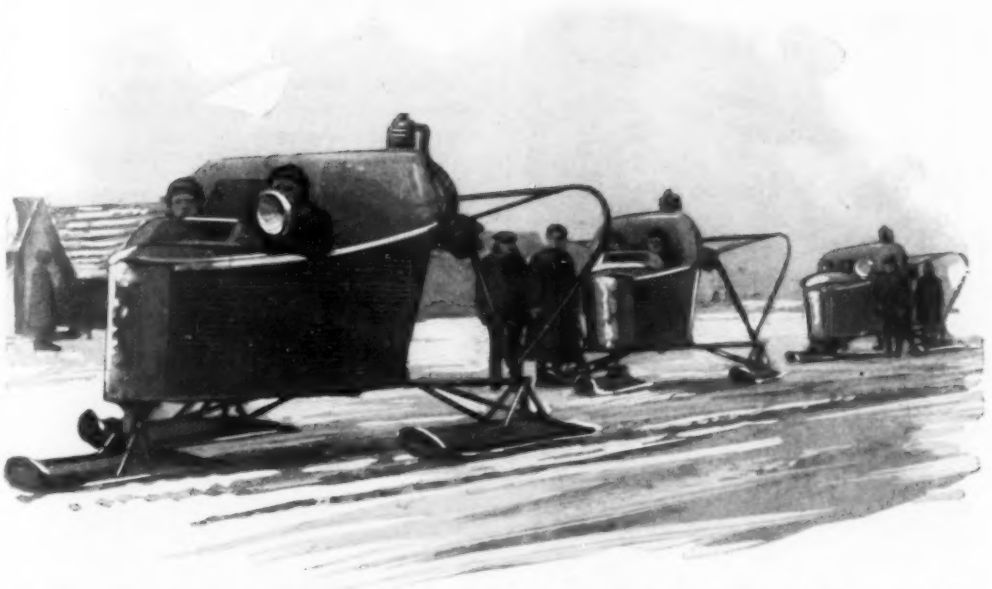
LANDING FIELD IS CLEARED OF FOG ELECTRICALLY

Success in the problem of clearing fogs from airplane-landing fields is promised as the result of recent tests at an eastern factory. A large compartment is filled with man-made vapor from high-pressure water nozzles. It becomes so dense that electric lights in the chamber are hardly visible. Then a dozen jets of highly electrified water are sprayed into the room, and almost instantly the fog fades out. This experiment is a modification of the laboratory test of clearing a jar of smoke by the passage of an electric spark. Partly successful trials at clearing fog by the use of electrified sand have been made. The dust is shot from an electric chute while the airplane flies above the cloud. Tests have shown that the upper part of the fog bank disappears, and it is believed that more complete success would follow if the sand were more highly electrified.

CHILD'S HORSE AND BUGGY RUN BY PULLING BRIDLE

Amusement and healthful exercise for children are afforded in a mechanical horse and buggy exhibited recently at a German show. The operating equipment is concealed within the horse and, by giving the bridle a slight pull, it is set in motion, sending the buggy, rider and all, forward.

Even Adults Like to Ride the "Racer"; Pulling the Reins Actuates Mechanism in the Horse, Propelling It Forward



For Winter Travel across the Frozen Fields of Russia and for City Traffic, Too; Motor Sleds Developed by the Aerodynamics Institute at Moscow

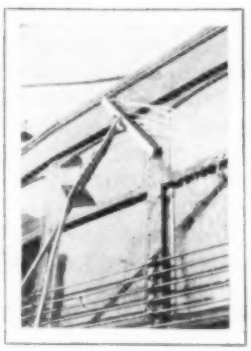
SLEIGHS RUN BY PROPELLERS REPLACE HORSES

Sleds equipped with motor-driven propellers have been tested in Russia for country and city use. They are a product of the aerodynamics institute at Moscow, where research in various fields of motor transportation has been conducted.

TERRAPIN-GROWING ON FARMS NOW PROFITABLE INDUSTRY

With the best variety of terrapin selling at $72 a dozen, additionally encouraging reports have been received from the bureau of fisheries to the effect that terrapin culture can be made a profitable business. The conclusion has been reached after several years of experimenting, since heavy demand threatened the extinction of the species about the Chesapeake where the best kinds were found. The most successful results have been attained in the salt and brackish marshlands of the south, where the culture of the terrapin is described as one of the "least difficult in the live-stock industry." They have few enemies except man, will stand almost any amount of neglect, are subject to few diseases, eat almost anything, hide in the winter and require so little care that one man can easily tend 50,000. On the other side of the picture, they do not thrive in filthy water, overcrowding injures them, they must be impounded to prevent escape and should not be disturbed, especially in the laying season. Some varieties are slow-growing, requiring ten or twelve years before they are big enough for market. Experiments are being made to produce faster-growing varieties.

WINDOW SQUEEGEE AND SPRAY SAVES TIME AND WORK



Developed especially for washing car windows, a squeegee and spray combined has proved effective. According to reports, four men using it can clean and dry thirty-six windows and two glass doors of a car in two minutes, a substantial saving in time over usual methods. Water is supplied through a hose at the end of the cleaner.

Where Canvas Still Is King; Glimpse of Some of the Vessels in the Alaskan Salmon-Fishing Fleet

GLORY OF SAILING-SHIP DAYS STILL SEEN IN FISH FLEET

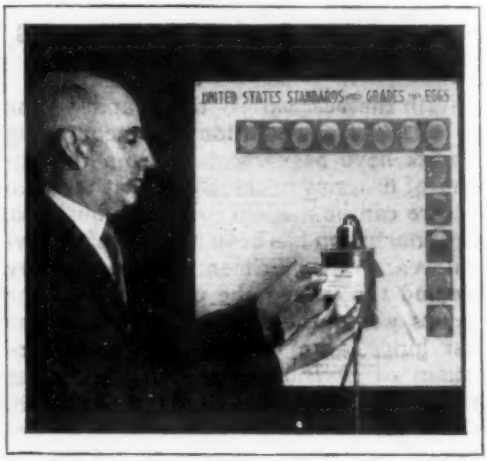
The days of the sailing ship are all but past. Masts piled high with billowing canvas are as rare a sight on the high seas today as was the smudge of a steamer fifty years ago. A notable exception is the fleet of square-riggers used for salmon fishing in Alaskan waters. With the coming of spring, crews are signed on, sails sent aloft and "bent," cannery supplies loaded, and they are off for the Bering sea. When they reach the north, the sailors turn fishermen and daily set out in small boats, delivering the catch directly to the canneries. In the fall, the men rejoin their ships as sailors and the fleet returns to winter quarters in San Francisco bay, near Alameda. In this group of stanch old ships, every one of them sound and seaworthy, are some whose histories date back to the days of the Civil war. There are oaken ships, iron ships and steel ships, representing the three ages of marine construction. They range in size from 1,250 to 3,000 net tons and include full-riggers, barks and barkentines, vessels with crack passages to their credit, and most of them have had close calls.

AMERICAN OWLS TO KILL RATS IN SOUTH SEA ISLANDS

A shipment of owls was recently sent from San Diego, Calif., to Lord Howe island, South Australia, to be used in exterminating rats that have been threatening crops there. The principal produce is palm seeds, and the rodents, arriving from incoming vessels, had multiplied so rapidly that they menaced the life of the palm trees on the island. Attempts were made to eradicate them with cats, but this plan failed, and consequently the owls were called into service.

MEASURE AIR SPACE IN EGGS TO JUDGE QUALITY

As an aid in the government's efforts to further standardize different grades of eggs, the department of agriculture has developed an instrument for measuring the air space in the eggs. It is used in connection with a candling device and is placed over the egg so that the air cell can be compared with measurements printed on the gauge, and the quality thus more quickly judged.



Grading an Egg by Measuring Its Air Space; Chart Behind Gives Diagrams of Different Qualities

With the Circus Candy Butchers

Venders Are Keen Students of Human Nature and Help to Keep the White Tops Moving

By EARL CHAPIN MAY

WHOEVER heard of a circus without peanuts?

This candy butchers' challenge to the towners sitting on the circus seats or surging into the sideshow and menagerie is answered by millions of annual sales.

The circus college, which gives him his degree after he has studied human nature from the Atlantic to the Pacific coast and from upper Canada to Mexico many years, plays no favorites. No pupil has a pull with the hard-boiled faculty. Anyone who gets a concessionaire's degree earns his honors honestly. Frank Gavin earned his long ago.

"I take no stock in that troupers' tale about how John Robinson invented red lemonade," says Frank. "That yarn asserts that when lemons were scarce on the Robinson show and John was seeking a substitute, he happened to drop a red horse blanket into a tub of water, whereupon the public, which falls for the red beverage, mobbed the Robinson soft-drink stand.

"From being just a plain peddler, the candy butcher became a concessionaire who either bought the candy privileges outright or shared his profits with the 'governor' or owner of the show. Most big circuses now own their 'concessions' and hire some expert to manage them on salary plus a bonus on the sales. But the title 'concessionaire' still sticks.

"The circus business will never change its nature or its appeal. The elephant, clown and candy butcher will be features of our big-tented shows as long as they hold the road. But while the circus will

never change essentially, changes of business methods follow normal business trends. When I was a candy butcher, working for $3 a week and sometimes getting it, the slogan of the circus lots was, 'We're here today and gone tomorrow.' Now it's, 'We're coming back next season.'

"In keeping with the increased responsibility of circuses, 'gypping' is no longer practiced on the circus seats; that is, it isn't practiced on the larger shows. Time was, within most memories, when the boy in white coat who sold you peanuts or lemonade walked away with most of your change or charged you all he thought the traffic would bear. Now, on most of the better shows, the price you're to pay for anything you buy from the butcher is plainly marked on a sign he carries in his hat. Also, nine times out of ten, you can trust him with a $10 bill and he'll come back with all the change you're entitled to.

"Contrary to the popular belief, most of the candy butchers' business during the performances comes not from the high-priced reserved seats but from the 'blues.'

"The color complex which prompted the good people to patronize old John Robinson's red lemonade controls our business to this day. People like anything that's brilliantly colored, and red is the greatest favorite. So, while we have popcorn bricks made with both yellow and red sirup, you'll find that most of our stock is in the red. You'll also notice that the little birdies that flutter from sticks which our specialists offer to the pulsing crowd, are bright yellow. These novelties were dead stock with us when they first came out in pale shades. That's true of balloons, also. It's the red, blue and yellow ones that go.

"Although my department's income comes pretty close to ten per cent of what the ticket wagon handles each and every day of the thirty weeks' tenting season, each town and district varies in its demands. Boston is a top-notch peanut town. Brooklyn is a darb on ice-cream cones. As soon as we go south, we load up on chocolate.

"Peanuts will always be the most popular, thanks to the human appetite—and the elephants. I've long marveled that the big beasts, which probably never met a peanut in their native Asia, should be so crazy about the goobers from our southern states, but so it is. I've seen 'Alice,' a one-ton elephant, eat $20 worth of the hump-backed, double-jointed delicacies and do it in one standing without yelling for paregoric afterward. You don't have to teach the circus bulls to boost my peanut game."

Ready to Work the Streets during the Parade with a Line of Canes, Flags, Balloons, Whistles and Other Merchandise; in the Afternoon the Street Venders Turn Candy Butchers in the Tent

LOSS OF WEIGHT IN BREATH

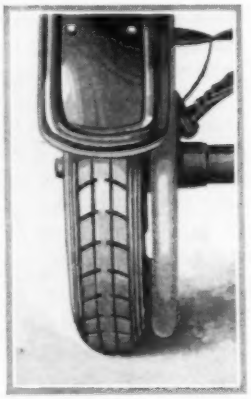
A woman of average weight loses about an ounce an hour in moisture given off by the lungs and skin, and a man's loss is about one-third higher. These interesting results have been attained by scientists of the Carnegie institute in recent experiments, with the aid of special balances. Two scales were used, both sufficiently strong to sustain the weight of a man, yet sensitive enough to record extremely small changes in weight. One indicated differences of one-third of an ounce and the other was 100 times more sensitive. With the aid of an auxiliary device, separate measurements were made of the losses from the skin and from the lungs, and other instruments gauged the amount of carbon dioxide given off, the percentage of water in outgoing breath and also its temperature.

How They Get the "Fighting Close-Ups" for the Movies; the Actor Literally Wrestles with the Camera while Close to the Lens

"WRESTLING" CAMERA IN MOVIES REGISTERS FIGHTING FACE

To show facial expressions of actors during fights, a "wrestling" camera has been devised. It is similar to other instruments of the type operated by an electric motor, but is mounted on a strong, spiral spring instead of on a solid base. The actor grasps two handles in front and literally struggles with the camera while the film records changes in expression, his face being but thirty inches from the lens. With this system, excellent close-ups can be obtained.

RIDE WITH A PUNCTURED TIRE ON EXTENSION RING



To prevent damage and loss of time due to punctures, an English inventor has devised an extension rim and hard-rubber tire, to support the car in case the pneumatic unit becomes deflated. It is always in service, easily put on or taken off, by means of the slightly longer bolts which are provided, and takes the place of a spare tire, when the motorist does not wish to carry one.

MERRY-GO-ROUND MAIL BOXES SIMPLIFY DELIVERIES

At a crossroad in Pennsylvania, mail boxes have been placed on a wheel under a shelter, so that the postman can gain access to all of them simply by turning the rack, and patrons are spared trouble in using their boxes. Only one is exposed in the opening at a time. The shelter is of attractive appearance.

AIR BLOWERS INCREASE "LUNG" POWER OF AUTOS

Did you ever see a fat man puffing uphill, gasping to get a little more air? That's just the way an auto engine acts pulling up a steep grade in high, and supplying that extra breath of air is the function of the supercharger. It's just a pump that fills the cylinders full of fresh mixture at every stroke. It doesn't wait for the pistons to suck it in, but goes right ahead and pushes it into the cylinders under pressure. You see, it takes about fourteen pounds of air to burn one pound of gasoline, and the more air you can force into the cylinders the more fuel you can burn, and the greater the power. Superchargers have developed along two distinct lines, the positive and the centrifugal type. The first is a pump that takes in a large volume of air and forces it into a smaller cylinder, thus building up pressure. The centrifugal type builds up pressure by taking air in at the center of a rapidly revolving fan and flinging it out t the tips by centrifugal force, where its velocity is converted into still more pressure by passing through a diffuser which slows up the air flow, and makes it more dense. It must operate very fast and give practically no pressure at low engine speeds. For this reason it is used mostly on racing cars and on airplanes, while the positive type is being perfected for passenger cars. Of course, you've seen these little racing cars scooting around the tracks. They are all supercharged. Engines half the size of a Ford, and developing six times as much power, that's what the supercharger does for them! Gas is pumped into the cylinders at a pressure as high as twenty pounds a square inch. For passenger cars, the supercharger offers even more advantages than it does for racing. For one thing, smaller engines can be used, with better mileage. The modern car of fifty horsepower uses only fifteen or twenty horsepower for average driving, the rest is reserve power for hills, acceleration and fast driving. If you replaced this engine with one of twenty-five horsepower, plus a supercharger, the engine would operate at better efficiency under average driving conditions, giving more miles to the gallon of fuel, while the supercharger would supply the reserve power required. A short while ago an experimental supercharger was attached to a six-cylinder car. Acceleration and flexibility were amazing. You could use high gear for starting and drive through traffic without shifting. From a bare crawl the car picked up swiftly and smoothly, with never a jerk or hitch, when the throttle was pressed clear to the floorboards. Valve timing, ignition setting and carburetor adjustment were less sensitive, and could vary appreciably from the correct value without affecting the operation, thus increasing the interval between adjustment and overhaul. As to cost, an engine that will develop fifty horsepower without a supercharger will develop well over seventy-five horsepower with one. The cost of the fifty-horsepower engine with the supercharger will be less than the cost of the unsupercharged seventy-five-horsepower engine.

Examining a Supercharger Built for Passenger Cars, with Carburetor Attached

ELECTRIC WALLS AND FLOODS GUARD BANK VAULTS

A man touching a switch ten miles outside of London can now flood the big vaults of the Bank of England should a foreign army ever land in England or a

mob threaten the security of its treasure rooms. The structure is being rebuilt so that the bullion vaults, in an emergency, could be flooded from two other places, one in the bank itself and the other in a distant place, the locality of which is a carefully guarded secret. Besides the flooding devices, an ingenious system of paneled concrete blocks is designed to render the vaults burglar proof. New walls are being built of concrete reinforced with the wire of old ships' cables. The blocks are two feet thick, two feet wide and six feet long and the cables separated into strands and fashioned into a sort of matting. The units are locked together and electric wires connect them. A cracksman, trying to pry through them, would break one of the wires and sound an alarm.

SEAM CLEANER FOR TROUSERS PROLONGS THEIR LIFE

Accumulations of lint and dirt are quickly removed from the seams of trousers with an outfit which a Michigan man has devised to simplify dry-cleaning. The essential part of the assembly is a cleaning wheel and blower operated by a motor. One leg of the trousers is slipped on a standard reversible cleaning board, the seams exposed, and in less than a minute, it is said, all four can be ridded of dirt. Besides helping to increase the service-

Blowing Dust Out of Trouser Seams with Motor Outfit; Job Is Done in Less Than a Minute

ability of the garments, the cleaner promotes more sanitary methods.

Carving Concrete Figures for Church Steeple near Paris; the Process Proves as Successful as Molding

SAINTS CARVED IN CONCRETE FOR CHURCH STEEPLE

The adaptability of concrete to decorative purposes is illustrated in a church near Paris. Its steeple and the figures of saints, and other ornaments on it, are made of cement, some of the details being carved by a French sculptor.

WEATHER HUNDRED YEARS AGO AFFECTS GLACIERS TODAY

Effects of the "dry seasons" of 150 years ago are revealed by some of the great glaciers in the Canadian rockies. Measurements made by the Smithsonian institution suggest that the ice masses have been receding at an increased rate lately, indicating that there was milder weather and lighter snowfall about a century and a half ago. The conclusion is based on the rate of movement followed by glaciers which "flow" less than 100 feet in twelve months. Because of this snail-like progress, it would take 150 years for an effect to transmit itself from the ice field to the tongue of a three-mile glacier.

Car-Wheel Tests at the Carnegie Institute; Measurements Showed That the Larger Wheels Reduce Power Losses

HOW BIG A WHEEL SHOULD BE ANSWERED BY TESTS

The average person who utilizes the products of factory, mill and mine would hardly consider that the prices of many of these articles depend to some extent on the size of car wheels; yet it is a fact that this is an item which plays its part in the cost of living. The size of the car wheel is definitely known to have a very direct bearing on the load carried. Giving the proper diameter to the car wheel is, therefore, an important factor in obtaining a maximum of service and speed and a minimum of resistance. Experiments have been conducted by the Carnegie Institute to determine the effect of the size of their wheels on the performance of mine cars, the results of the study being as applicable to other types.

These tests proved that the larger the wheel diameter the lower was the relative friction and consequent loss of power and load-carrying capacity. The power saving possible on straight track through the use of larger wheels may amount to thirty-eight per cent in making a change from eight to eighteen inches in diameter.

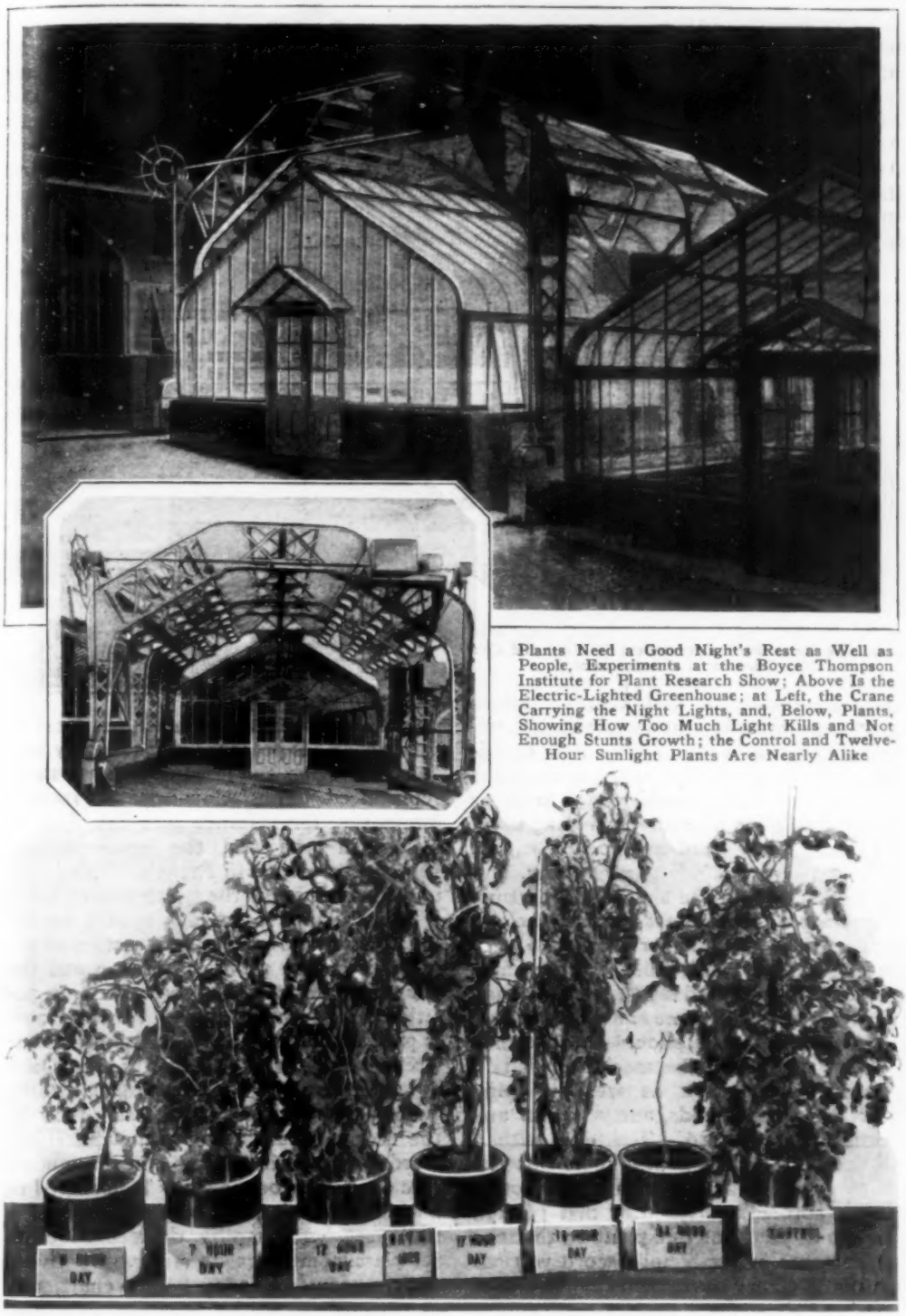
AUTO HEADLIGHTS SET IN BUMPER REDUCE GLARE

Elimination of the glare in the eyes of the motorist approaching and better illumination of the road, particularly at the sides, are claimed for an automobile bumper with headlights. They shine directly down upon the highway and are too low to seriously interfere with other drivers, while the rays are directed in such a manner that they show the ditch at the side of the road without the use of spotlight, it is said. The bumper is a strong, seamless tube, and the lamp lenses are so protected that they are little likely to break unless they come in forcible contact with a pointed object.

Bumper with Lights and How Rays Shine Down

¶Popular Mechanics Magazine does not publish the name of the maker or seller of any device described, but our Bureau of Information will furnish it, free.

PLANTS' NEED OF SLEEP IS SHOWN BY LIGHT TESTS



Plants Need a Good Night's Rest as Well as People, Experiments at the Boyce Thompson Institute for Plant Research Show; Above Is the Electric-Lighted Greenhouse; at Left, the Crane Carrying the Night Lights, and, Below, Plants, Showing How Too Much Light Kills and Not Enough Stunts Growth; the Control and Twelve-Hour Sunlight Plants Are Nearly Alike

MACHINE TALKS, PRINTS AND SERVES AS A TEACHER

By combining the principles of a phonograph and a printing press, a machine has been invented by A. L. Runyan of Los Angeles, Calif., that translates languages, speaking and printing the correct words simultaneously and, with a proper set of charts and records, teaches shorthand, telegraphy, both in the Morse and Continental codes, music harmony, voice, plays a game of bridge, printing each trick as played, and gives a general summing up of the game. Any child can operate it, and it lends itself to kindergarten study, giving the child both the auditory and visual perception of the subject matter, teaching him reading and number work. With a set of bird records, it will print the name of the birds on record tape, give their song or call, or print the name and tell a story of the different animals, should he place such a set of records in the machine. It is a portable phonograph as well, weighing about eighteen pounds, and will play any ten-inch disk record. Teaching with a phonograph is not a new idea, but the ability to select any portion of the sound record, automatically repeat that portion as often as you wish and print on the tape the contents of the sound record you are hearing is a new development. To select from an index chart subject matter in a familiar mode of expression and synchronize it with related unfamiliar modes of expression, seeing it printed and hearing it spoken, will revolutionize home study of foreign languages, it is expected. The immigrant, wishing to learn English, would have a night school and a master tutor in the machine. To operate the machine, a set of index charts is prepared in English by professors, having the lessons that are to be reproduced. Translations are made into the languages, for instance into the French, set up in type and the accompanying record is recorded in French. This is put in the machine, and the synchronizer, when it is set at any particular square on the index chart, moves a related section of the print record to printing position and the sound reproducer to a corresponding position on the sound record. When a crank is pulled, the machine talks and prints the French translation of the index chart. With sixteen double-faced index charts, rubber-stamp sheets and sound records, the user can have at his command 10,000 words in French or any other language. The sound reproducer may be changed to an electric one and, by plugging into a radio set, will amplify the reproduction for classroom or group study. By giving each student an index lesson chart, any number could get the results at one time.

Machine Showing Index Chart and Record Tape, Synchronizing Knob above Operator's Left Hand and Cabinet Open for Removing Record

PAINT STILL GROUND BY STONES PREPARED BY EXPERTS

Although years have elapsed since man first learned to prepare grain for bread by grinding it between stones, a direct survival of this process is seen in many milling operations today and is clearly demonstrated in one where the layman would least expect it. That is in paint making. A stone-age process is still an important step in preparing the protecting film for your house, your automobile and many other articles. In several mills, before the paint is tinted and diluted with oils for final consumption, it is ground between special stones to crush the ingredients thoroughly and to insure perfect mixture of the pigment. These stones must be of a particular kind, to prevent glazing and too rapid or uneven wear. Some of the best ones come from France and another excellent variety is quarried only a few miles from New York city. Dressing the stones for the mill, that is, cutting the grooves and furrows to afford a grinding, crushing surface, is a special task that only experts can do. The art is said to be known to only a few men in this country.

ELECTRIC VAPOR INHALER AIDS TREATMENT OF COLDS

To supply hot, medicated vapor for the relief of colds and various nose and throat ailments, an electric unit has been devised. It operates on 110-volt house current and consists of a small heater which is placed in a glass partly filled with water, having a cone attachment that directs the vapor toward the nose and mouth. Medicine used is held in a special container and a metal cover over the glass prevents wasting of the fumes. The outfit is especially useful when quick relief is wanted, saves bothering with stoves and kettles and, when not needed for inhaling, may be employed as a sterilizer for liquids.

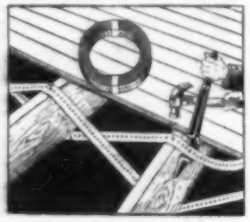
Cone-Shaped Pouring Pot for Applying Hot Asphalt in the Repair of Streets

ASPHALT-POURING POT HELPS IN PATCHING ROADS

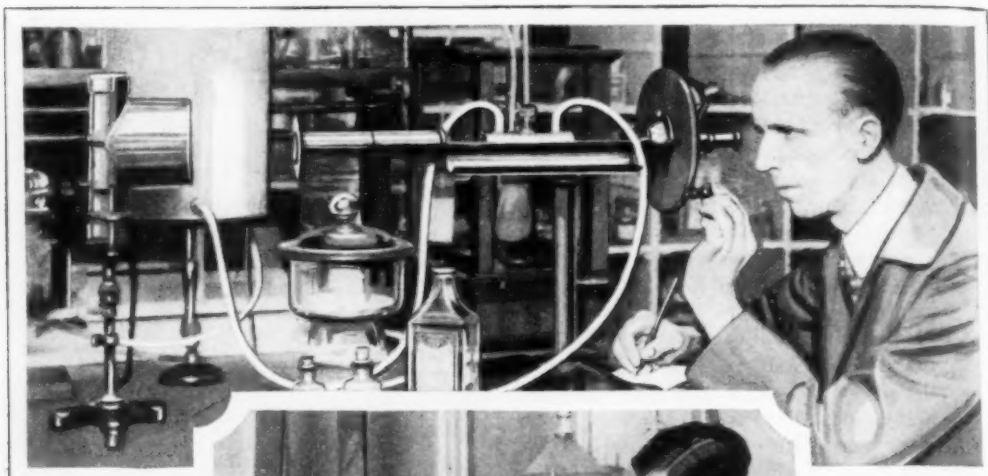
For fixing breaks and cracks in private driveways, as well as public roads, a conical asphalt-pouring pot has been found helpful. The flow of the material is easily regulated and directed where needed, reducing waste and trouble.

ENDLESS STEEL-JOIST BRIDGING SUBSTITUTE FOR WOOD

Reduction of cost, and greater durability and strength are claimed for a steel substitute for wood as bridging between building joists. It is furnished in three sizes for different types of construction, is applied with stretching wrenches and affords tension before the load is placed on the floor. It is painted with acid-proof paint and comes in convenient coils 100 feet long. The steel eliminates weaknesses caused by poor fitting, flaws and splits in wood bridging.



HOW SCIENCE GUARDS THE THINGS YOU USE DAILY



A Chicago Mail-Order Company Maintains a Laboratory to Test Samples of Everything It Sells. Above Is an Expert Testing Sugar, Essential Oils and Extracts, and Below Is a Light Test That Gives Suits and Other Cloth a Year's Exposure in Forty-Five Hours

Wear-Testing Machine, at Left, Which Draws Abrasive Bricks over Samples of Leather Belting and Shoe Soles, Again and Again, to Determine How Much Wear They Will Stand before Giving Out; the Machine Was Built from an Old Automobile Crank Shaft

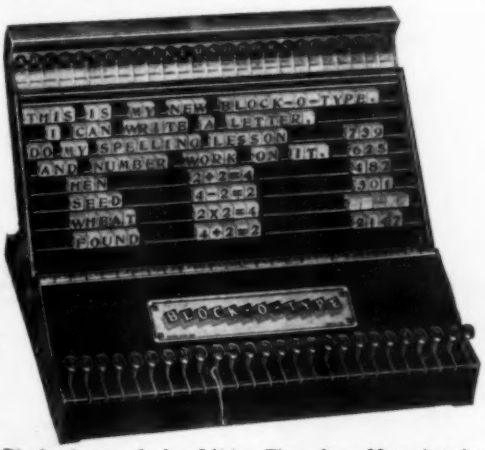
The Hardness-Testing Machine, at the Right, Discloses How Much Life You Will Get Out of Your Anti-Skid Chains

NEW PRINTING INK TO HELP RECLAIM OLD PAPER

Removal of the ink is one of the greatest difficulties in reclaiming newsprint and other paper for use again, but this obstacle is said to have been largely overcome in an ink German experts have prepared. It contains chemicals which are said to fade almost completely under a half hour's treatment with an acid, yet it does not change under ordinary light and air. A faint blue, remaining after the acid treatment, is said to disappear in the pulping process. Although it costs more than ordinary inks, a future saving is seen through less expense in de-inking old paper.

PUPILS ARE TAUGHT TO SPELL BY BLOCK MACHINE

Instruction and amusement are both afforded children in a novel outfit combining some of the features of the typewriter and printing press. It has twenty-six keys, one for each letter in the alphabet and an accompanying character. When a key is pressed, a little wooden block appears, bearing that letter. The block is lifted out, placed in any one of several ledges above the keys and another block obtained by pressing a different key for making up words or arrangements of numbers. The key controls a magazine, each containing fifteen blocks, making 390 for the entire set. Each block bears two capital letters, one in lower case and a character. When finished with the blocks, the child inserts each in its proper magazine or holder at the top of the rack and it slides down, ready for removal again when its turn comes at the key. Children thus learn to associate the letters with the words more quickly and are aided in working simple problems in arithmetic. There is space for a lesson of considerable length on the rack.



Blocks Arranged after Lifting Them from Magazines by Pressing Keys at Bottom; Feeder Openings at Top

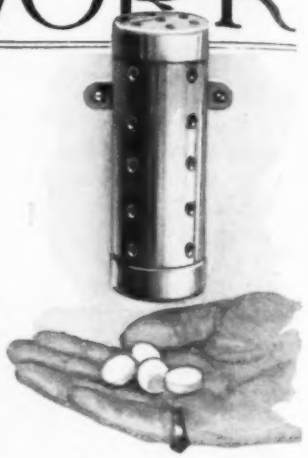
Electric Heart Tester in Operation; Pulse Is Accurately Registered and Charted as It Beats under Pad

ELECTRIC DOCTOR TESTS HEART TO DIAGNOSE DISEASE

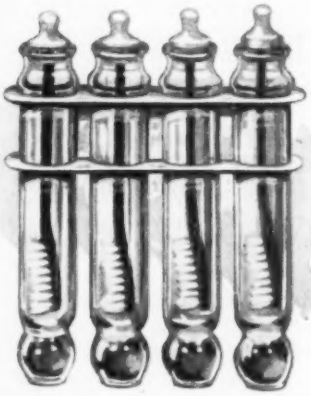
"Just let me slip this on your wrist, please." The nurse adjusts a pad over the patient's hand, a wire is connected and without the knowledge of the wearer, his pulse is registered in another part of the hospital, where a doctor, examining the beats, can detect various heart ailments if they are present. The apparatus is known as an electrocardiograph. With its aid, heart beats have been broadcast by radio, so that a physician in one city can diagnose the heart trouble of a person many miles away. The instrument will scarcely disturb the patient, so that his heart action stays normal instead of being accelerated or modified by knowledge of the examination.

To Save Work

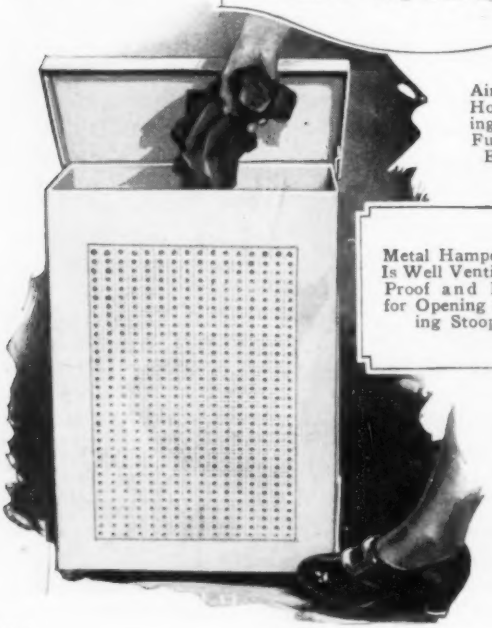
Compact Electric Range Which Cooks Entire Meal at One Time and Operates from a House-Lighting Circuit, Saving Costly Installations; Food Requires No Attention after Once in Oven, and Upper Heating Element Is Adjustable to Different Heights for Special Dishes



To Eliminate Cooking Odors, Perfume Tablets Are Kept in Perforated Holder Attached to Wall

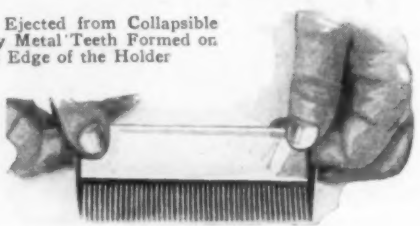


Air-Tight Toothbrush Holder Has Sterilizing Agent in Bottom, Fumes from Which Eliminate Bacteria



Metal Hamper for Clothes Is Well Ventilated, Mouse-Proof and Has a Pedal for Opening the Lid, Saving Stooping Over

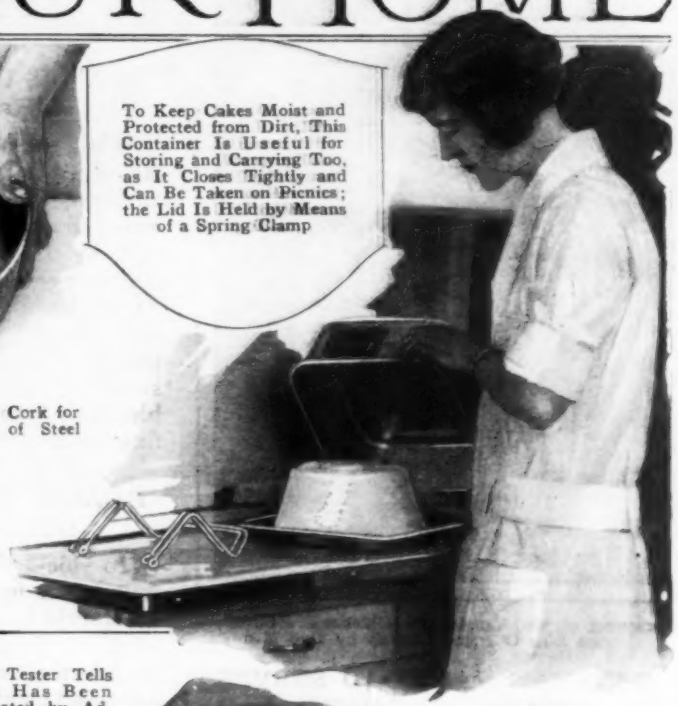
Dirt Is Ejected from Collapsible Comb by Metal Teeth Formed on the Edge of the Holder



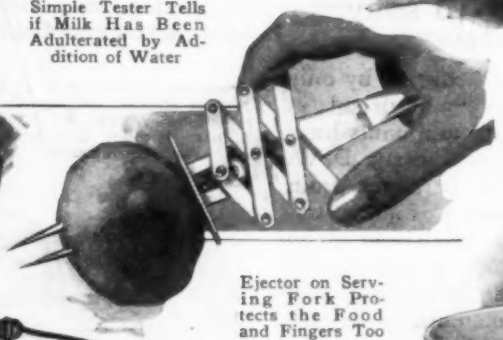
in YOUR HOME

Metal Clamp Holds Dishcloth or a Cork for Scouring and Utilizes Last Bit of Steel Wool, Reducing Waste

To Keep Cakes Moist and Protected from Dirt, This Container Is Useful for Storing and Carrying Too, as It Closes Tightly and Can Be Taken on Picnics; the Lid Is Held by Means of a Spring Clamp

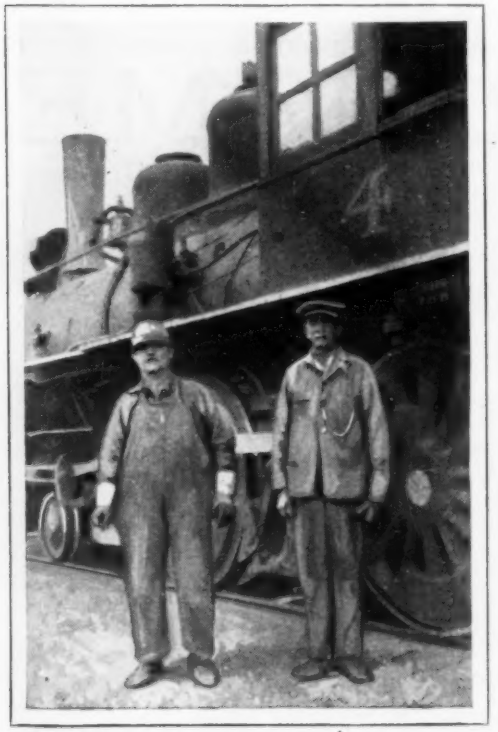


Simple Tester Tells if Milk Has Been Adulterated by Addition of Water



Ejector on Serving Fork Protects the Food and Fingers Too

At Left, an Adjustable Steaming Grid in Kettle Permits Cooking Food So That Valuable Substances Are Saved and Reduces Shrinkage; at Right, Is a Special Outfit for Cleaning Floors, with Pockets for Brushes and Soap and Compartments for Cloths, Clean and Dirty Water



Personnel of the Kansas and Oklahoma Railroad, a Steam Line Operated Entirely by Two Men

TWO-MAN RAILROAD SERVES KANSAS FARMERS

Although it is operated entirely by only two men, a nineteen-mile railroad in Kansas serves six stations and hauls hundreds of grain and other cars yearly. D. W. Platz is ticket agent, freight agent, train dispatcher, section foreman, roadmaster, conductor, fireman, brakeman and claim agent, while J. H. Hodges is engineer. When farmers along the line want a few cars, they call Platz, the engine is fired up and the orders delivered. In busy seasons, a daily trip is made and at other times, three a week.

WATER AND OIL PUMP FOR AUTO ALSO OPERATES HORN

Quickly installed on the Ford car or truck, a water-circulating pump has an oil-pump attachment and a powerful horn which is operated by a pedal on the floorboard. Power is supplied to the unit from the fan belt, the water pump having a capacity of thirty gallons a minute and the oil, three gallons. The latter is so adjusted that oil is sprayed on the connecting rods under any angle at which the car may be operating. A spray nozzle is screwed into the side of the crankcase directly in front of each connecting rod.

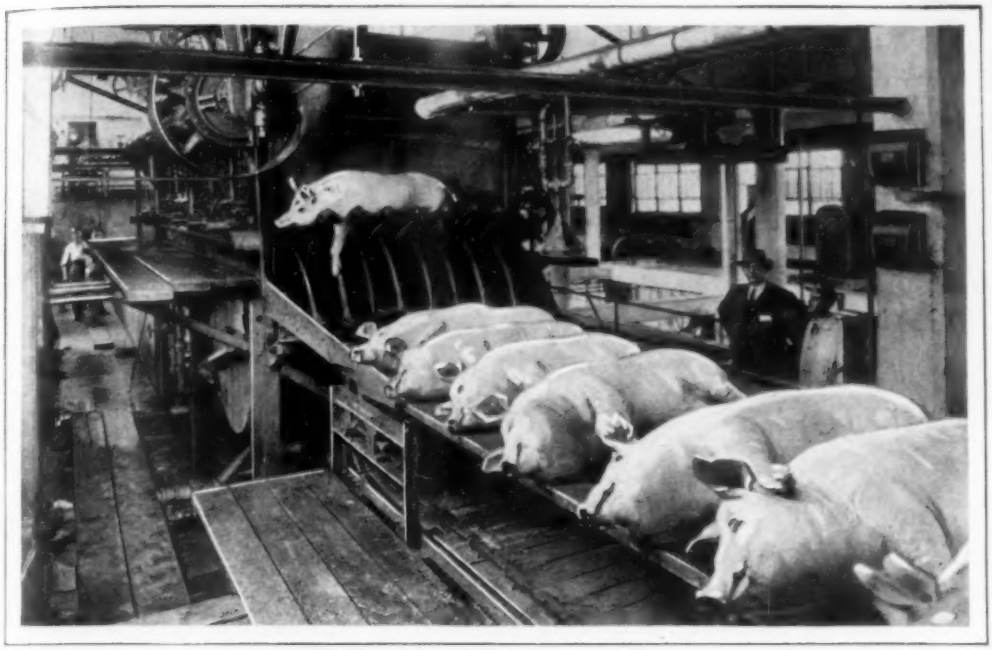
MUCH IS UNSEEN TO THE EYES IN RAY OF SUNLIGHT

While the human eye is a wonderful instrument, it records but one-third of the sunlight, the rest being on wavelengths either too high or too low to register. Certain insects are believed to see these rays that escape the human eye and their presence is manifest by their effects. Ultra-violet rays, for instance, react on photographic plates, although our eyes cannot see them, and while the X-rays are invisible, their "shadow" can be observed on a fluorescent screen.

HORSES WEAR RUBBER ARMOR DURING BULL FIGHTS

To shield them from the horns of the bull during fights, horses used in the rings of Madrid have been fitted with an armor of rubber padding. It is adjusted so as not to interfere with the movements of the animals and guards them at vital points.

Protection for Horses in Bull Fights; Rubber Padding Designed to Ward Off Horn Thrusts without Interfering with Movements



Hogs Coming from the Hair-Removing Apparatus; as Many as 1,000 an Hour Can Be Scraped in the Larger Outfits of This Kind, Saving Hand Processes and Loss of Time

SCRAPING HOGS BY ELECTRICITY ELIMINATES USE OF HOOKS

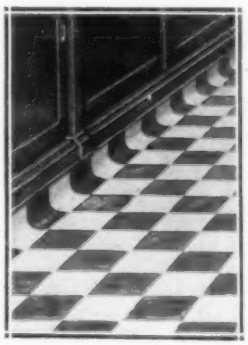
One of the most recent units to speed operations in large butchering plants, is an outfit for scraping hogs. As the animals come from the scalding vat, they are conveyed into a cabinet arrangement in which are sets of flexible scrapers. These are said to thoroughly remove all hair and refuse, and after the hog has been cleaned, it passes out of the machine, drops on a table and is ready for the next step in butchering. A separate conveyor is supplied for salvaging the hair. The largest machines have a capacity of 1,000 hogs an hour. They save using hooks and insure greater regularity in handling.

RETIRED TOPEKA STREET CARS USED AS STORES

Instead of being junked, several street cars, replaced by auto busses in Topeka, Kans., are in useful service although they are no longer running. They have been converted into stores, cottages, tourists' camps and chicken coops. A motorman purchased one car for $50 and used it as a display room for a stock of stoves. Another was fitted as a confectionery and refreshment stand, and a third was remodeled into a home and rented for $12 a month. Two cars were rebuilt into dining and sleeping quarters for a summer camp.

LINOLEUM ON CURVED MOLDING PROTECTS BASEBOARD

To guard the baseboard against mop marks and other scratches and to eliminate the usual crack where dust and dirt collect, an improvement in laying linoleum has been introduced. Next to the base, a length of inverted quarter-round molding is placed, and the linoleum is carried up about six inches. A very narrow molding is placed at the top to hide the edge. This plan results in a curved channel all around the room, so that sweeping is more easily done, the base is shielded and a more attractive appearance presented.



The Realistic Ribs of a Ship Buried in Sand, an Excavation and a Recovered Skull, with the Director Explaining the Action; a Typical Set Manufactured for the Movies

Doing the "Impossible" in the Movies

Answering Strange Questions and Supplying Queer Things Quickly Is Function of Unique Organization

DOING the "impossible" quickly, answering questions that are beyond belief or reason and supplying everything from skeletons to ships, is the business of a Los Angeles organization.

"Hello," a voice from a busy movie studio calls. "How tall was Cleopatra?"

"Five feet, two and one-quarter inches," is the immediate answer to a question that might have taken a studio's research expert a month or more to solve.

Throughout the day demands and inquiries pour into this amazing establishment, the like of which can scarcely be imagined:

"Get us 2,000 lady bugs by Friday."

"Could the Gulf of Mexico be used as a location for the Bey of Tunis?" And the answer: "No, not unless you put him in a rowboat. He is a man and not a body of water."

To give an idea of the extent of the stock carried by this organization, the Western Costume company, the present contents of the building would dress and fully outfit over 25,000 people—and furnish their homes also.

The reference library is worth hundreds of thousands of dollars to motion-picture producers. Shelf upon shelf of books, pamphlets and tomes intermingle with common, costly and rare volumes. Every known science is represented, but books of travel predominate.

These volumes are in charge of Edward Phillips Lambert, director of research. He supplies the answer to the comedy director who wants to know how the Eskimo says

Two Storerooms of the Movies; Above Is the Treasure Department, Where Valuable Antiques Are Kept; They Are Never Removed, but Copies Are Made from Them; Below Is the Armorer's Department; the Gunsmith Keeps All of the Weapons in Repair

"I love you," and condenses the plot of Hamlet after this fashion: "Well, a man murders his stepfather out of revenge for the slaying of his own father. And the crux of the play is a mix-up with swords and poison."

Wandering through the twelve floors which the establishment comprises, is like taking a trip around the world—from prehistoric times to the present—and beyond. Many of the things to be seen never existed except in someone's imagination. The "Goofus," for instance, has the tail of a fish, the wings of an eagle and the head of a mummy. There are miniature ships, including everything from a replica of Noah's ark to a tiny ocean liner, and figures of saints, old liquor bottles, coffins, glass eyes and even stuffed elephants.

The medal collection, comprising at least one duplicate of every known medal cast from the time of Julius Cæsar, is considered one of the best in existence. Originals of this collection, as well as musical instruments, arms, saddles and a myriad of other priceless antiques, never leave the building. They are guarded as zealously as a museum protects its treasures. Only duplicates are rented out.

The shoe collection contains thousands of pairs brought from all parts of the world. Persian sandals, Indian moccasins, Chinese clogs and fur boots from Greenland lie side by side; shoes of wood, shoes of straw, of paper, cloth and leather, in all grades and all sizes.

The arsenal contains practically every offensive and defensive weapon that was ever used by man. Everything—from a stone club to a high-powered rifle—is there. A German machine gun, relic of the late war, frowns disdainfully on the long-barreled silver-mounted guns of the Moors. And there are bayonets, belts, holsters and hand grenades in stacks, and every imaginable type of sword—those of the Crusaders beside the great two-handed blade of Richard the Lion-Hearted. Brass knuckles appear puny in comparison with Stone Age weapons, war clubs and African spears. No matter what the movie director may

Molding a Statue, a Completed Mask and Wig, and a Worker in Ornamental Brass in Movieland

Weird Bipeds Manufactured to Illustrate a Dream, Above, and, Below, the Saddlery in Which the Hundreds of Riding Sets Are Stored When Not in Use by the Cavalry, the Cowboys or the Hollywood Indians Who Ride through the Western Films

ask for in the way of a weapon, it is there. The armor collection shines like well-polished silver. And no wonder. It is kept as well oiled as the finest of machinery. Were the Knights of the Round Table to visit here they would go wild with envy. No longer would it be necessary for them to stagger around in steel suits that weighed a ton. A lightweight substitute has been invented that has all the appearance of genuine metal but which is as light as felt. And it actually is felt—a composition with a metallic surface.

A casual glance about the costume floors reveals uniforms of every nation and period of history—classified according to their types. Cowboy outfits, waiters' togs, Chinese coolie dress, miners' caps, all kinds of army and navy uniforms, tights and African "G" strings. In fact every conceivable piece of apparel, worn by humans since the beginning of time, is represented.

There is the uniform worn by Gen. Sherman of Civil war fame. Old and blue—showing signs of active wear—it was purchased for $35. Embroidered on each shoulder are two silver stars denoting the rank and recalling the famous "March to the Sea." Hanging behind it is the uniform of Gen. Grant and one worn by Adm. Farragut at the battle of Mobile bay.

Motion-picture cameras have been so perfected in the last few years that the quality and texture of fabrics show with remarkable accuracy. For this reason the very finest of silks, satins, linens, woolens and furs are used—and tailored to measure. Therefore, your favorite star can, and often does, wear screen clothing on the street and at social affairs. And when you see what you think are antique furnishings on the screen, they really are as represented. Exquisite importations that are upholstered in the most delicate shades and tapestry are not "cheaters." They are genuine articles and many are priceless.

An idea of the tailors' abilities to do things in a hurry is demonstrated by the fact that 1,500 military uniforms have been designed, made to order, and turned out

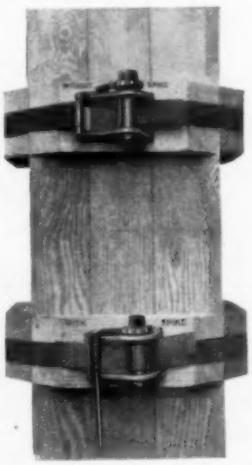
An Elaborate Costume Piece That Required Much Research and a Vast Investment in Special Equipment; a Scene from a Film Depicting One of the Battles of Washington's Continentals

complete in every detail, including equipment, within thirty days without interfering with regular business. Three or four costumers in this department often get out rush orders of fifty and one hundred costumes on an hour's notice. These are, of course, taken from stock.

Once someone sold a load of old costumes for junk. The very next day there came a call from one of the upper floors for rags—more rags. Beggar costumes were being made and old rags were needed. New rags would not do. They photographed new. That little sale to the junkman, which netted $12, cost the company over $900. Natural wear cannot be faked—at least not for the eye of the camera. For this reason even the most tattered costumes are preserved for the time when the busy telephone calls for rags of streets of Paris, 1870, or other similar requests.

CLAMP FOR CONCRETE COLUMNS CUTS CONSTRUCTION COST

To simplify the task of holding the forms for concrete columns in place, an improved clamp now on the market is said to have met the requirements of contractors and is so easily adjusted that two men can attach sixty of them in an hour. They are used in connection with an iron strap which is anchored to the clamp, passed around the column and through an opening in a drum on the clamp. This drum is then tightened with a nut and locked when the desired tension has been reached. The straps can be used repeatedly on columns of the same size, and the clamps are said not to injure the forms in any way.



¶Old railroad rails have been salvaged for ties on an eastern line, two pieces being used for each tie; they are held together by metal plates welded in position at each end of the pieces of rail.

Suit in Carrying Rack Which Is Slipped into Case, Keeping the Garments Neatly Pressed

SUIT HOLDER FOR TRAVELERS KEEPS GARMENTS PRESSED

For traveling and for delivering suits of clothes from stores or the tailor's, a special rack that holds the garments tightly, so that they cannot wrinkle or become disarranged, has been devised. It is made of wood or fiber. Suits are easily inserted or taken out and use of the holder saves room in the luggage.

STEAM HEAT SOLD BY METER IN NEW YORK BUILDINGS

Steam is bought instead of coal to heat and operate some of New York's skyscrapers and apartment buildings. A recent survey shows that more than seven billion pounds are being sold through meters annually to serve over 800,000,000 cubic feet of space. While discussions have been going on concerning the erection of central heating plants, forty-five miles of mains have been extended over the east side of the city. More than 2,000 buildings, including some of the largest in Manhattan, are each buying an average of 3,500,000 pounds of steam every year.

Evidence of Electrical Progress in Japan; Beautiful Tower at Recent Exposition as It Appeared under Floodlights

BEAUTY OF JAPANESE TOWER REVEALED BY FLOODLIGHT

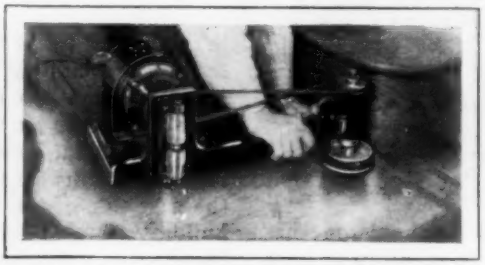
Sparkling under the radiance of hundreds of floodlights, a crystal tower was one of the spectacular features of Japan's electrical exposition in Osaka. The fair showed what great strides have been made in recent years in adapting electricity to the industries of the land of cherry blossoms. The development has extended to factories, street and interurban railways and to the Japanese home, where time and labor-saving devices, such as are popular in this country, are winning approval.

UNWASHED DISHES MAY BREAK

Dishes in which gelatin desserts have been served, may be found broken if they are left standing for some time without washing. The reason is that when the gelatin dries, it exerts a force strong enough to pull the dish apart or to chip it, in some instances. Egyptians similarly used wooden wedges, soaked with water, to split rock. The expansion of the dried substances in the wood caused the stone to break.

FLOOR FINISHER FITS CORNERS

Places that cannot be reached with the usual type of electric floor finisher are accessible to a compact unit now on the market. It is equipped with both disk and drum to which sandpaper is readily attached by patented devices. For work in corners, against baseboards, around curved edges and similar tasks, it is especially adapted, eliminating the need of hand work which is usually necessary when large machines are used. The outfit is run by a one-fourth or one-third-horsepower motor, furnished for direct or alternating current at thirty-two or 110 volts. One of the special features is an automatic pressure release. As soon as the hand is removed from the grip, the finisher is disengaged.



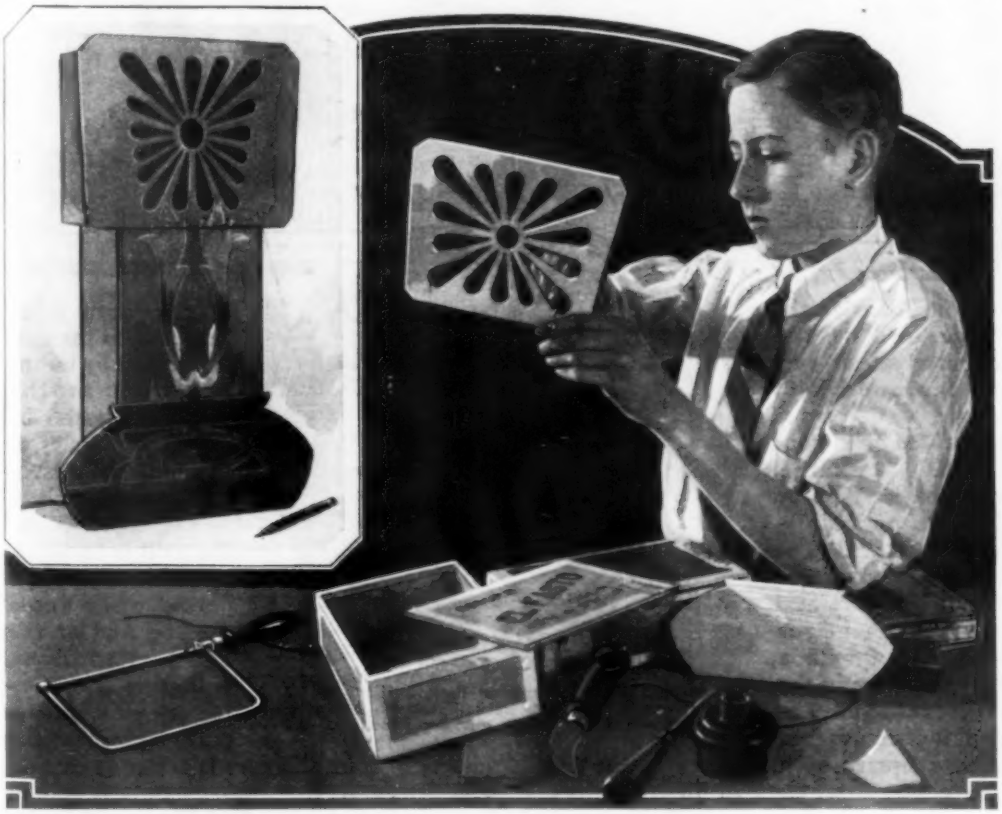
Polishing Close to a Rounded Corner; This Task Is Possible with Finisher That Reaches Hard Places

Speaker Built from Cigar Boxes

By S. N. EDWARDS

THE neat and serviceable loud speaker shown in the photo was made from no more expensive material than a few empty cigar boxes. Speakers of this type may be placed either on the table or hung on the wall. If properly built and equipped with a good speaker unit, the tone is remarkably good for a horn of this size. The built-in horn is supported only from the top and front, which type of non-rigid construction seems to add much to the tone. The horn proper should be built entirely of cigar-box wood, as this gives the best tone quality; the casing, however, may be built of any ¼-in. wood.

The first step is to form the block for the speaker unit. Three pieces of wood are cut 1¾ in. square and glued one on top of the other to make this block. When the glue is thoroughly dry, a hole, slightly smaller than the nose of the speaker unit, is drilled through the center of the block. Any good standard unit of the type designed for phonograph or horn will make a very satisfactory speaker. The block is then set aside and the inner-horn front and back pieces are prepared. These pieces are 5½ in. long, 3½ in. wide at the top and tapering to 1½ in. at the lower ends. The horn sides are then cut, and a center line drawn on the board will be found helpful when making these; the width at the bottom is 1½ in. At a height of 5½ in., on the center line, the width is 3½ in., and from this point the sides are cut straight. On the front side, this straight cut is 5 in. long but at the back it is only 2 in. From this point, at the back, the sides are polygonal to form the upper "curve" of the horn. This may be laid out

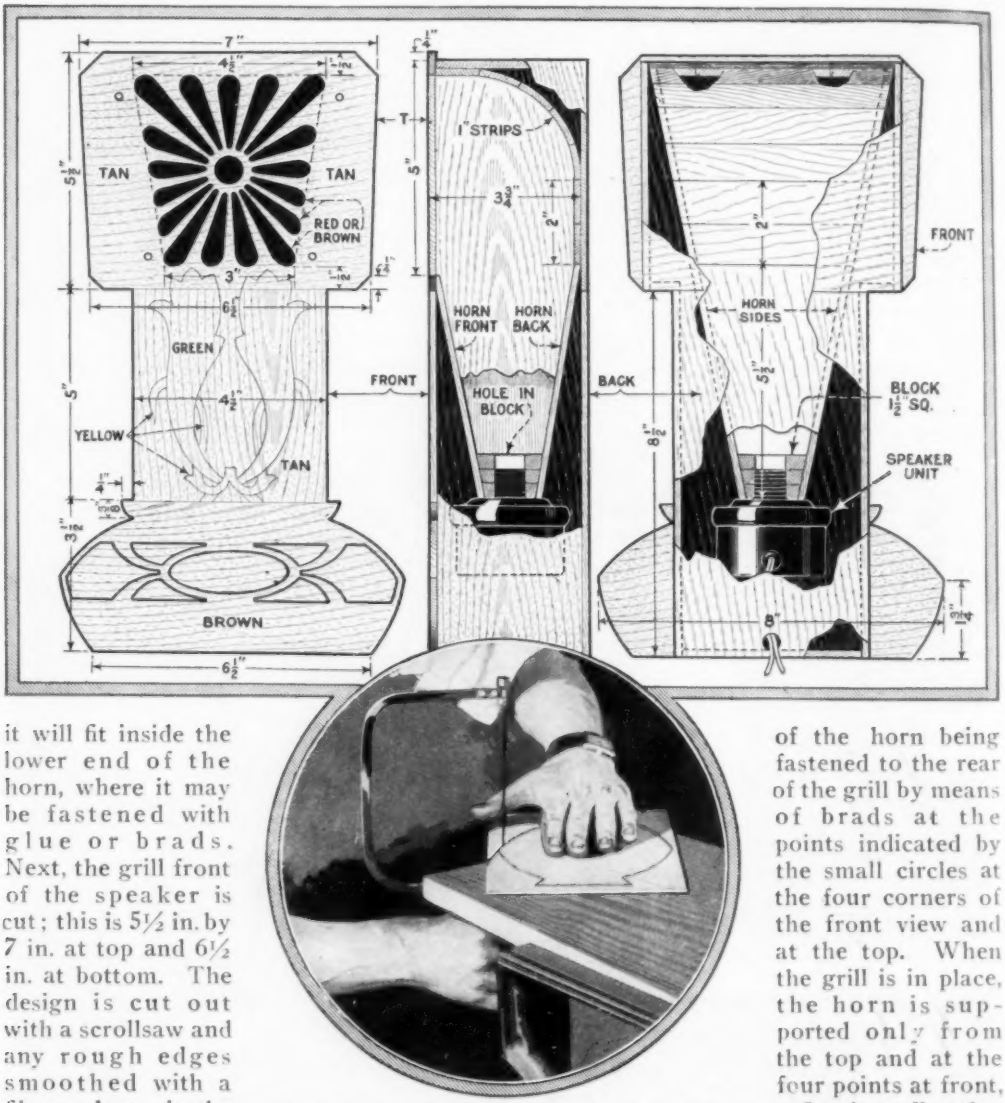


Upper Left, Finished Speaker Showing Suggested Decoration; Above, Cutting and Trimming the Grill

by marking off 1-in. "flats," each at an angle of 18° to the next. With small brads and glue fasten the back, front and sides together, and complete the upper curve with 1-in. strips of the ¼-in. wood. Fill in any crevices with glue and trim off the ends of the strips.

The unit block is then beveled so that it will fit inside the lower end of the horn, where it may be fastened with glue or brads. Next, the grill front of the speaker is cut; this is 5½ in. by 7 in. at top and 6½ in. at bottom. The design is cut out with a scrollsaw and any rough edges smoothed with a file, as shown in the illustration. The grill is then covered with a square of silk, glued to the back. The center front piece of the casing is 4½ by 5 in., and the lower vaselike base is 3½ in. high, 5 in. wide at top and 6½ in. at the bottom. The "bulge" is 8 in. wide at the widest section, 1¾ in. from the bottom. The sides of the lower casing are 8½ by 3¾ in. and the upper sides 5¼ by 3¾ in. The bottom and top pieces are 5¾ by 3¾ in., the lower back piece 8½ by 4½ in. and the upper back piece 4½ by 5¼ in.

The casing is now assembled, the front of the horn being fastened to the rear of the grill by means of brads at the points indicated by the small circles at the four corners of the front view and at the top. When the grill is in place, the horn is supported only from the top and at the four points at front, a floating effect being thus obtained that increases the clarity of tone. If care is taken in cutting and fitting, so that the assembly is solidly constructed, the results will be well worth while. The design may be outlined on the



Construction Details, Showing Section View of Side, and Cut-Away View from Back; Inset, Method of Using Scrollsaw in Cutting Out Lower Panel and Grill

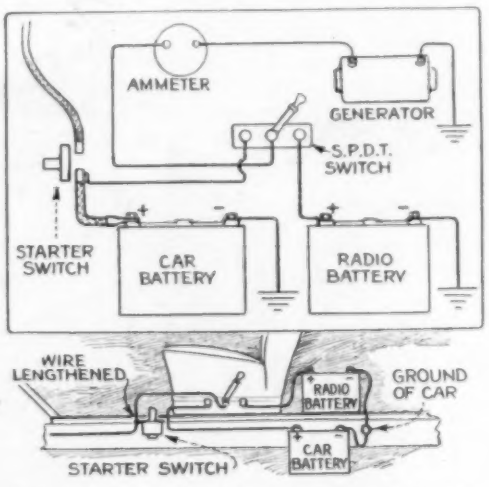
front with a tracing wheel, after the back ground has been carefully sanded and lacquered. This design may then be filled in with brushing lacquer in suitable colors, which will give a pleasing and attractive appearance to the finished speaker.

Reamer a Useful Radio Tool

The long tapered reaming tool that fits the standard brace is one of the handiest tools a radio builder can own. Quickly enlarging panel holes to fit various sizes of screws, instrument shafts or bushings, this tool saves time as well as wear and tear on the experimenter's patience. Drills are not always available for the exact size of the hole wanted, but it is an easy matter to use a small drill and enlarge the hole to the proper diameter with the reamer.

Charging a Radio Battery

When one does not feel justified in purchasing a separate charger for the radio battery, it can be fully charged within a few hours, if hooked up with the auto electric system, as shown in the illustration. A knife switch is mounted under the seat, or in any other convenient position. One end terminal of the switch is connected to the starter switch, the center terminal to the ammeter, and the other end terminal to the positive post of the radio battery that is to be charged, while the negative post is connected to the negative post of the car battery. The two leads which connect to the radio battery may be set on the floor behind the front seat. The knife switch permits the current to be cut off from these leads when not used. It is advisable to provide a rubber mat under the storage battery to prevent possible damage to the floor rug. —Wm. Rosenblohm, Mountain View, N. J.



Method of Charging a Radio Battery in an Automobile and Connections to Be Made for the Purpose

Cabinet Speaker Has Eighty-Six-Inch Tone Chamber

A new speaker, employing an 86-in. tone chamber built into a neat walnut console, has recently made its appearance on the market. The cabinet is large enough to be used for any table set and also provides ample room for batteries or power units. The large grill at the front of the type shown in the upper photo is backed with gold cloth, but other models are provided with doors. The lower photo shows the rear of the console with the back panel removed; the horn is mounted at the front on sponge-rubber cushions. The air chamber is scientifically designed and is claimed to give flawless reproduction of both high and low notes. The cabinet is 34 in. high, 26½ in. wide and 16⅝ in. deep.

Above, Front View Showing Large Grill; Below, Rear View with Back Panel Removed

B-batteries should be not more than six feet from the set if best results are to be had.

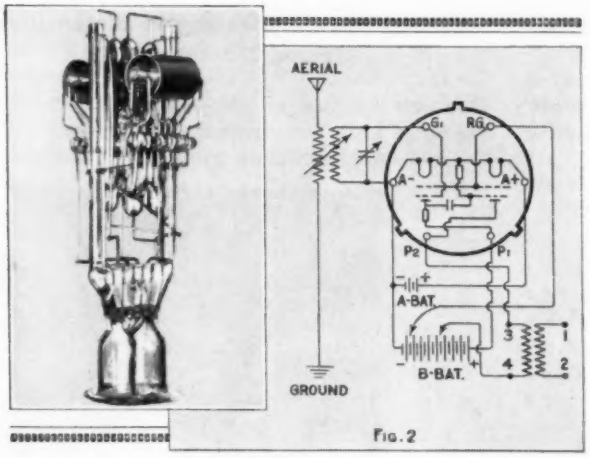


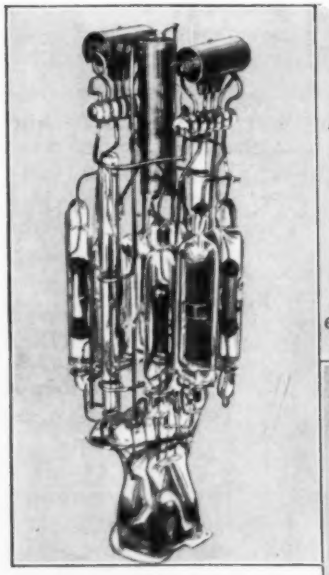
Fig. 2

Left, Internal Construction of Type 2 H.F., the Long-Distance Tube; Right, Simple Circuit Employed

Multiple Tubes Simplify Receivers

Multiple tubes containing three complete tube systems together with two resistance-coupled amplifier stages and one loud-speaker stage, as shown in the diagram, Fig. 1, have recently been introduced in Germany. The filament voltage is 4 and the total filament current required is approximately 3 amp. The filaments are connected directly to a 4-volt battery without a rheostat or filament control of any type. A 90-volt B-battery is specified and the plate current drawn is said to amount to from 3 to 5 milliamp., or about that required for a single-power tube of standard make. One tube of this type will give loud-speaker volume on an inside aerial for local stations and excellent volume on distant stations when used with the ordinary outside aerial. This tube is known as type 3 N.F., and the inner-element construction is shown in the photo at upper left, Fig. 1. The sketch at lower right illustrates the difference between the old and new systems; the new tube replacing the standard units shown in the circles. When extra-loud volume is required, as much as 150 volts may be used on the plate with very satisfactory results.

The tube is fitted with a six-contact base and a special socket is supplied; although this entire system has been incorporated in one unit, the tube is only slightly larger than some of our power tubes. The circuit employed is extremely simple, and merely consists of a variable inductance,



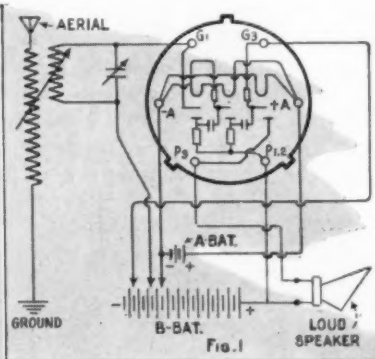
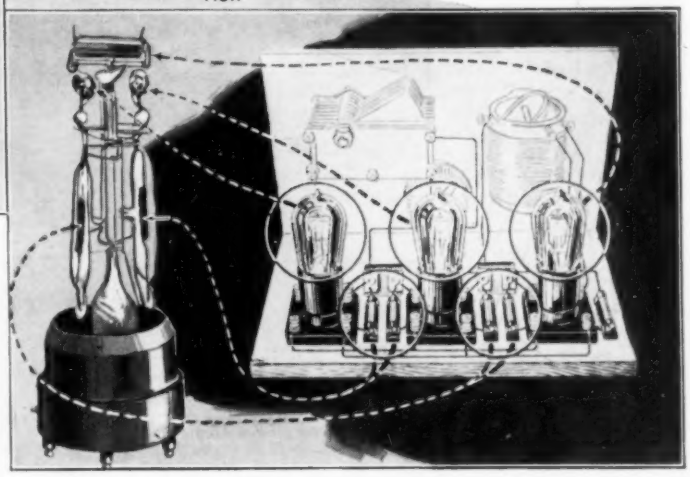


Fig. 1



Upper Left, Inside Construction of Triple Tube Type 3 N.F.; Right, Circuit Showing Simple Connections; Below, Units Replaced by the New Tube

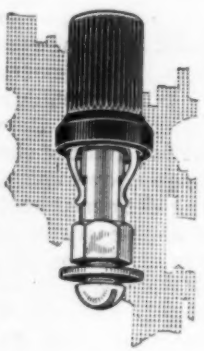
the secondary being shunted with a variable condenser, and the usual arrangement of A and B-batteries. In Fig. 2 a special tube known as type 2 H.F. developed for long-distance work is shown; in external appearance this tube is similar to the type 3 N.F.; it consists of two double-grid tubes and the necessary coupling, as shown in the diagram. The filament voltage for this tube is also 4, directly applied; a 90-volt B-battery and from 10 to 20 volts of C-battery being required. This long-distance tube may be used as a first stage for all types of receivers; it is, however, particularly suited for use in conjunction with the type 3 N.F. triple tube.

Filament-Control Units Simplify Wiring

The simpler the wiring the better, both from the mechanical as well as the electrical standpoint, in wiring the radio receiver. Long leads should be avoided wherever possible, and the elimination of unnecessary hand-operated rheostats from the front panel will enable the builder to use much less wire. Automatic filament-control units of the cartridge type may be mounted at the side of the tube socket, or several tubes of the same type may be controlled with the same unit if the proper resistance value is employed. These control units require little room, and may be placed in any odd corner since, once installed, they require no further attention.

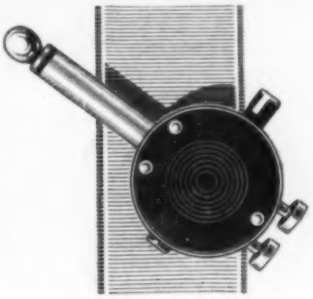
Solderless Cable Terminals

Snap terminals of the kind shown in the drawing, which come in different colors so that they can readily be distinguished, are convenient to use on flexible, stranded battery wires, as they do not have to be soldered on, yet make good electrical connection. About ⅛ in. of the end of the wire is bared and slid into the bakelite sleeve, after which the connector end is screwed on. This spreads the end of the wire in the sleeve, and binds it with perfect security.



Push-Button Plug Corrects Polarity

A push-button plug for correcting the polarity of the loud-speaker or phone connections is a new device offered to radio fans. It insures maximum results of speaker or headset by providing immediate means of obtaining the correct polarity. Just press the button and you have it without withdrawing the plug from the jack or changing the connections.



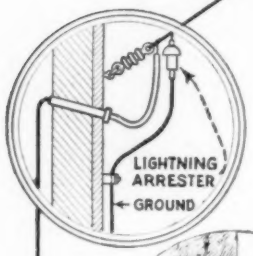
Handy Markers for Battery Leads

Handy identification markers for battery leads, now available, are made of polished aluminum and can be clamped around the wire with a pair of pliers. As it is highly important that battery leads be carefully marked to prevent mistakes in making connections, the tags are particularly handy in wiring console sets in which the battery leads are long and difficult to trace. The markers are made stamped in black and come in assortments of nine, bearing A, B and C-battery designations.

Small Clamp Used as Vise

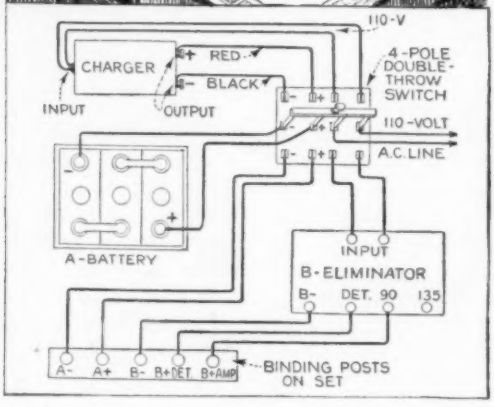
A little metal clamp of the type used for holding small glued wood parts may be used as a vise for holding any small object you may wish to solder. It is often difficult to hold small parts while soldering, especially radio parts such as lugs, switches, fixed condensers, etc. Get the type known as the C-clamp; mount the back of the clamp between two small blocks of wood and the result is a vise that is very handy for small work.

Safety First in



LIKE any other piece of electrically operated apparatus, the radio set requires intelligent installation for safety, convenience and efficient functioning. Early radio experimenters, interested only in results, had to use such equipment as was readily obtainable, and the work progressed amid a jumble of unsightly wires, batteries and charging devices. Then the console cabinet came into use in an effort to hide the mess and was partly effective, though there were still aerial and ground wires and a tap from the lighting line stretched around the room behind the picture molding or tacked to the baseboard. The cost of the console keeps most of those who already have a good table-type cabinet from buying one, and their batteries remain in plain view or partly hidden in a dark corner. Installations of this type are not only unsightly but a decided liability, because damage to rugs from spilled battery acid, and short circuits caused by trailing wires, are likely to occur.

Within the last few months the widespread use of B-battery eliminators for higher B-voltages and trickle chargers has not only complicated the problem of hiding these accessories, but has introduced a need for better insulating and more orderly installation. Any electrical device operated from the house-lighting line may cause serious shock if the body is well grounded, as has been demonstrated many times when people have tried to use electrical devices, such as curling irons or massage machines, while in the bathtub or in contact with a well-grounded water or plumbing system. There is no particular case known to the writer where such accidents have happened to users of radio sets, but now that the house-lighting current is employed, the sensible thing to do is to take the same precautions as employed for any other devices using lighting current.



When installing the new set or modernizing the old, the part to begin with is the aerial, and the sketch in the insert on this page shows the correct method of bringing the aerial lead into the building. Note that the insulator tube is slanted from the inside down so as to prevent the entry of water during rains. A lightning arrester should be installed on the outside of the building in the manner shown, and run to

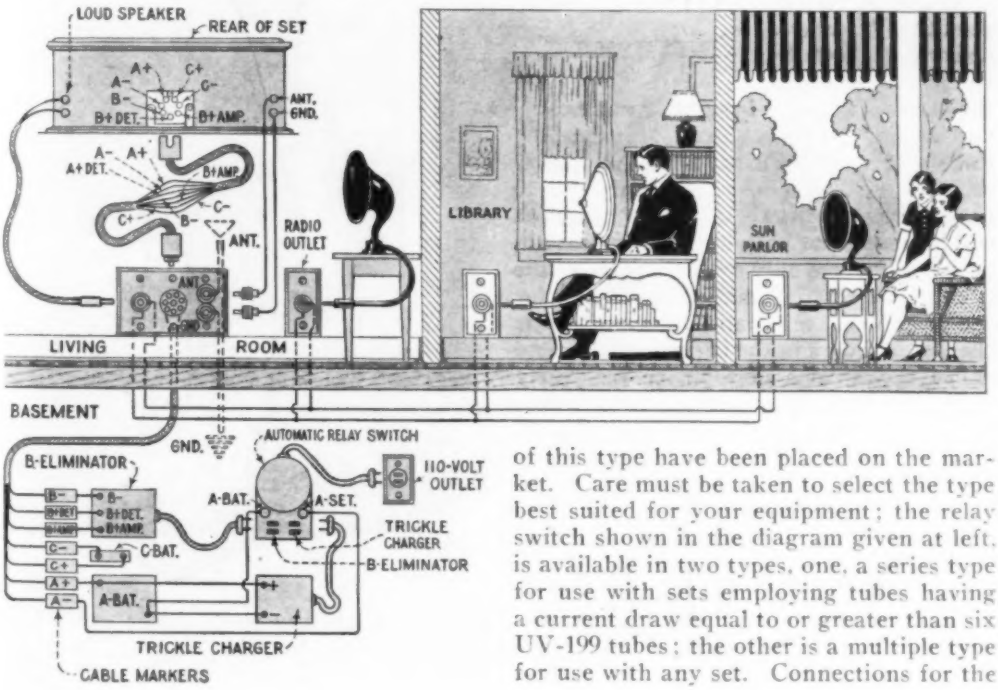
Receiver Installation

By Frank L. Brittin

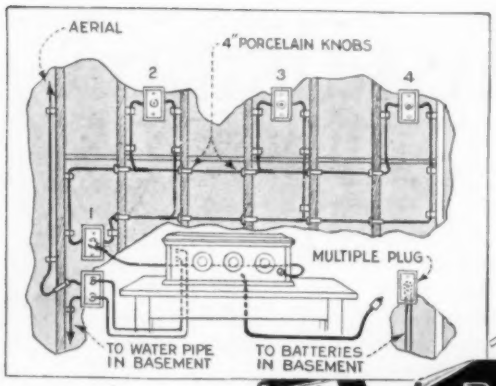
a good outside ground; this protects both the building and the set, and requires no attention later on. The switching device shown in the diagram at the bottom is of the manually operated type still in common use by the experimenter, and is safe enough when properly installed. However, it is not recommended where there are small children about and is shown only as a comparison between the old and new methods. With the new devices now on the market, safety and neatness are both possible, for the A-battery, B-eliminator and charger can be removed to the basement (directly below the set) or hidden away in a near-by closet, and the wires carried through the wall in insulating tubing to a plain brass outlet plate little different from the wall outlets in common use for portable lamps and other fixtures.

With such equipment the radio set can be disconnected as easily as a floor lamp and moved to permit cleaning of the room, since it is neither tied down by a mess of wires to a lot of batteries, nor weighted down, as in a console cabinet, by fifty or sixty pounds of accessories.

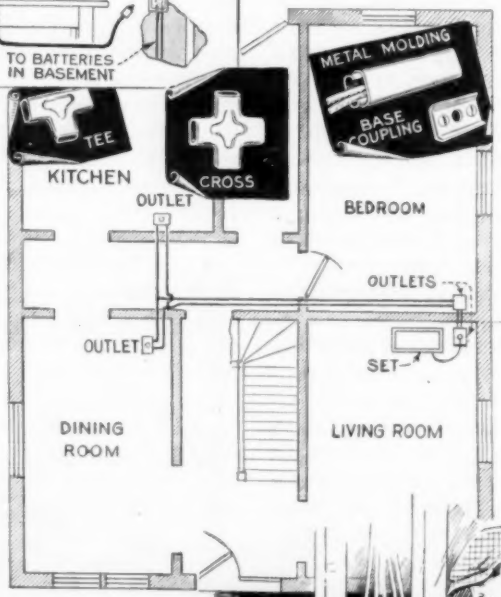
A very complete installation of this type is shown on this page, and, in addition to the battery equipment, aerial and ground connections as well as loud speaker outlet, facilities for other rooms are taken care of. If it is impossible to run wires in the wall, the outlet plate can be placed in the floor, and the multi-cord cable plugged into it or, as an alternative, a small hole can be bored through the floor and the wires brought up through it from the basement and directly to the set. When batteries and charger are placed in the basement or in a closet, an automatic switch is almost a necessity, and during the past few months several highly efficient devices



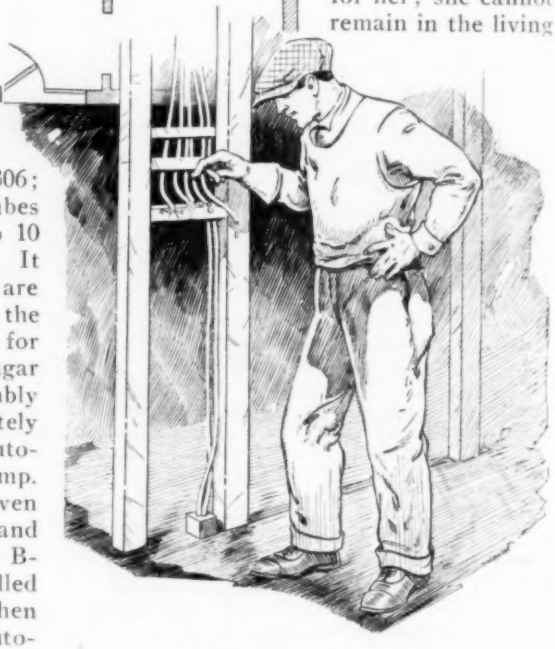
of this type have been placed on the market. Care must be taken to select the type best suited for your equipment; the relay switch shown in the diagram given at left, is available in two types, one, a series type for use with sets employing tubes having a current draw equal to or greater than six UV-199 tubes; the other is a multiple type for use with any set. Connections for the



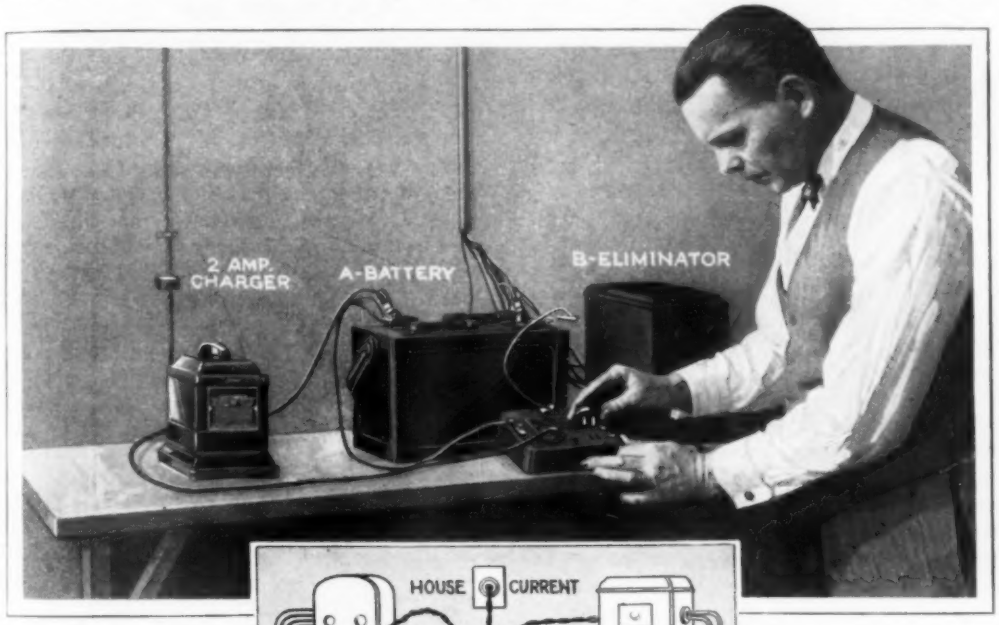
first type only are shown in the diagram, but the connections for the second type are very similar. The relay is used for the purpose of switching such devices as trickle chargers, B-eliminators, etc. It may be used to connect and disconnect either a trickle charger or a B-eliminator, or it may be used to connect and disconnect both by simply operating the filament switch on the set. Another and similar device is shown on page 306; this unit is tapped for use with 3 to 5 tubes drawing ¾ to 1¼ amp., and for 5 to 10 tubes drawing from 1¼ to 2½ amp. It will be noted that both of these devices are designed for use only with chargers of the trickle type. An automatic control unit for use with 5-volt tubes and a 2-amp. tungar charger is shown in the basement assembly on page 305; this new device has lately made its appearance and solves the automatic switching problem where 2-amp. chargers are involved. The diagram given below the photo is self-explanatory, and requires little comment, charger and B-eliminator being automatically controlled by the filament switch on the set. When the set is not in use, the charger is automatically connected to the storage A-battery and the charge continued until complete, when the unit automatically disconnects the charger. This instrument is not for use with the older types of chargers employing an auto-transformer in their construction, such as the vibrating type, or the older model of the Westinghouse charger, unless a condenser is connected in series with the ground lead of the set. A .006-mfd. molded-type condenser is recommended in this case.

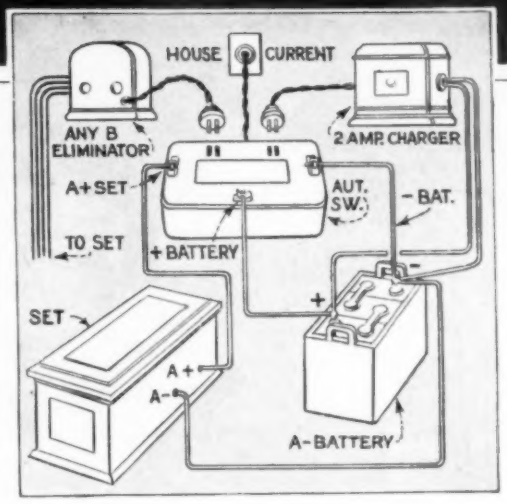


The home completely wired for radio is not the curiosity that it was a year or so ago, since radio-broadcast reception has become such an indispensable element in the home life of the typical American family that it has outgrown the living room. The housewife, busy about her daily work in various parts of the house wants to listen in on programs especially broadcast for her; she cannot remain in the living room and get any work done; radio has entertainment for the summer evening group on the porch; it is used in the ser-



vants' quarters; to provide music during the dinner hour; for the morning setting-up exercises and to tell bedtime stories to the children. If advantage is to be taken of these privileges, it is necessary to provide a speaker outlet in each of the various rooms. This is not difficult but must be carefully done. The wiring may be as simple or as elaborate as pocketbook and taste may dictate; it is often, unfortunately, a temporary type of exposed wiring offensive to the eye, as well as a sample of poor judgment in handling electrical wiring. It should be a permanent, concealed wiring job, either built into the house under construction, or installed in the house already built. The diagram at upper left is to be distributed, and then consult the radio dealer or electrical contractor regarding the installation, or undertake the work himself. It is always best to wire for high voltages even if the present set is a small one requiring low power, so that the wiring need not be torn out to accommodate a larger set. The wiring should be in accordance with the fire underwriters' requirements, and if the home is under construction, it can be run in flexible armored cable or conduit, side by side with the usual electric wiring. If the wiring is to be installed in a house already built, it may be of the concealed variety, run in flexible armored cable which is slipped between the walls and floors, or the much simpler



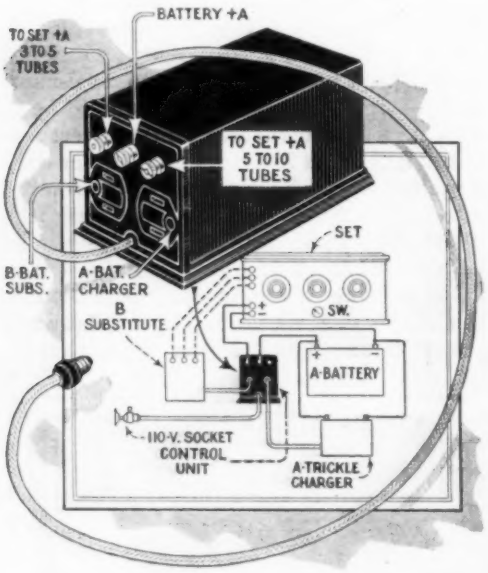


on page 304 will give the reader an idea of the usual method employed.

There are no fixed rules as yet for radio wiring, so each case must be handled individually with the safety factor always in the foreground. The home owner must decide just to what extent radio service

method of using neat metal molding may be employed. This molding, although exposed to view, is not objectionable, especially when it is painted to match the color of the walls, ceiling or woodwork. A short section of the molding is shown on page 304, together with a tee,

and cross, required at junction points. Elbows, of course, are also available. The ground-floor plan gives the reader an idea



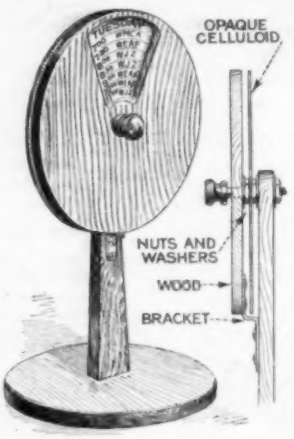
for laying out a similar plan covering his own requirements. The wires are shown away from the walls for the sake of clarity; the outlets in each room should be laid out in parallel and not in series. By this means, any number of outlets can be used at the same time without interference, and without switches being required at the remaining outlets. When laying out your wiring plan, group the outlets and select the location of the set so as to require the least possible amount of wiring; this idea is illustrated in the diagram.

Repairing Defects in Radio Cabinets

Flaws in radio cabinets or consoles caused by cracks in improperly cured wood or accidents that sometimes happen regardless of the amount of care taken by the cabinetmaker, can often be repaired by the following simple method. A special wax for this purpose is obtainable at all finishers' supply houses and comes in various colors to match the woodwork on which it is to be used. Use a thin pliable blade such as an artists' spatula, heat the blade and the wax over a gas or alcohol flame and apply the soft wax with the heated blade. Use the wax sparingly, smoothing the surface with the hot blade. This should be carefully done so as not to damage the adjoining surface; an application of polishing wax or furniture polish will then blend the repaired surface, and it will be difficult to locate the flaw.

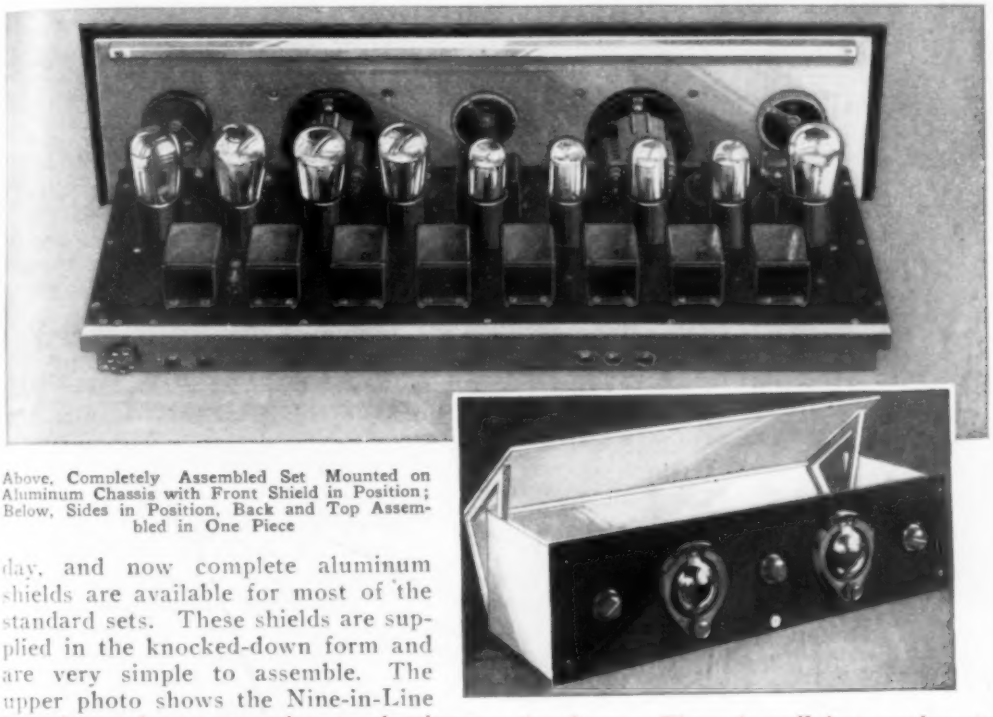
Time Chart for Daily Programs

A handy little chart giving the time of favorite programs broadcast each day is shown in the accompanying sketch; this little device, of simple construction, saves referring to the daily papers in search of the program desired. Most Sunday editions of the daily papers carry a complete schedule of local-station programs for the coming week; these programs are selected and inscribed on the dial card opposite the time, identifying the station with the hour. The dial is divided into seven sections, one for each day, and may be made of cardboard or celluloid. It is 4 in. in diameter, each of the seven segments being permanently inscribed in ink, with the day of the week and the hours as shown. Station letters should be entered with a pencil so that they may be erased as changes may demand. The sketch at left shows the completed unit and the simple construction details are shown at right; the stand is 8 in. high and may be made of cigar-box wood. The wood dial is 4 in. in diameter and drilled at the center for the shaft; the window at the top may be cut out with a scrollsaw, or a section removed by straight cuts from the outer edge if desired. This front cover is held in position on the upright by means of a small thin brass bracket bent in the manner shown in the sketch. A knob and shaft from an old rheostat can be employed to turn the celluloid dial. The dial is clamped between two hexagon nuts and mounted, as shown, on the upright.—W. P. Craig, New York City.



Aluminum Shields for Standard Sets

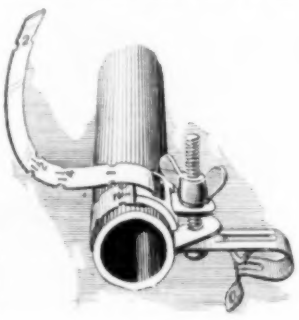
Leading radio engineers have long recognized the fact that proper shielding is an important necessity in a receiver today, and now complete aluminum shields are available for most of the standard sets. These shields are supplied in the knocked-down form and are very simple to assemble. The upper photo shows the Nine-in-Line superheterodyne mounted on an aluminum chassis, and with one of the metallic front shields screwed to the rear of the front panel. The lower photo shows the sides in place. The top and rear shields assembled in one unit are easily placed in position or removed to get at the set.



Above, Completely Assembled Set Mounted on Aluminum Chassis with Front Shield in Position; Below, Sides in Position, Back and Top Assembled in One Piece

Adjustable Ground Clamp Fits Any Pipe

Features not found in ordinary ground clamps are embodied in the one shown in the illustration. No tools are needed for its installation, the band being simply pulled through the slot diagonally, which prevents it from binding until it is pulled up snugly around the pipe, and it is then allowed to slip back until the edges of the slot catch the proper notch. Then the thumbnut is tightened, which makes the band secure around the pipe and prevents it from getting loose. There is sufficient surface to insure a good electrical contact and the bared end of the ground lead from the receiver is fastened to the snap clip, which holds it securely. The clamp is made of heavy copper for strength and durability, and can be used on pipes ranging from ½ to 2 in. in diameter.



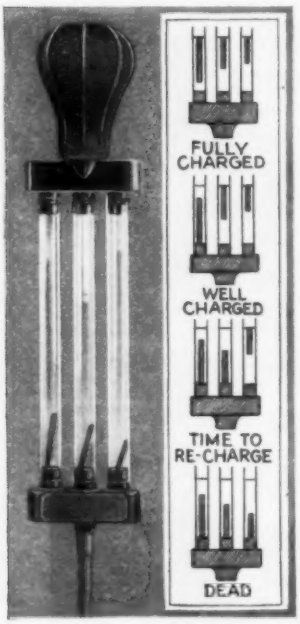
Ribbon Aerial from Old Ford Part

A ribbon aerial can be made from a discarded Ford magneto field coil. Each coil contains 11 feet of copper ribbon, ¼ in. wide, and these copper strips may be soldered together until the desired length is obtained. This makes a very good aerial.

¶If you wish to add materially to the appearance of your set have the panel engraved after all necessary holes have been drilled. The average cost of this work is two cents per letter and most dealers in radio supplies are prepared to do the work.

Three-Barrel Hydrometer Easy to Read

Ordinary hydrometers have one barrel and a weighted, graduated float inside. It often happens that the low level of the electrolyte in a cell does not permit enough to be taken up into the barrel of the hydrometer to raise the float sufficiently, which makes it impossible to take a reading. Another objection to the usual form of hydrometer is that the float, which is made of glass, is apt to break. Both of these troubles have been overcome by the novel three-barrel hydrometer shown in the photo. Only a spoonful of electrolyte is needed to obtain a reading. Each barrel contains a float of different specific gravity. If the solution raises all three floats, the battery is fully charged; if it raises the medium and small float, it is half charged, and if only one of the floats rises, it is time to recharge. If none of the floats rise, the battery is completely exhausted. A special tip extension on the nozzle is provided to facilitate testing storage B-batteries.

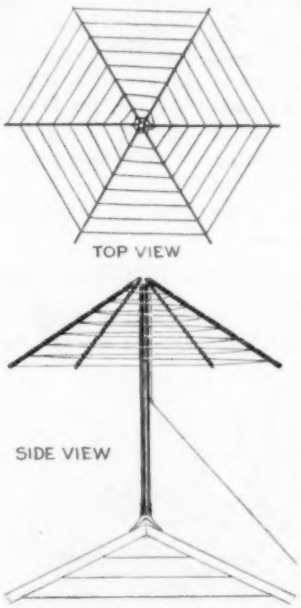


Adapting Short-Prong Tubes to X-Sockets

A simple but effective method of converting the UV-type base tubes so that they may be used in X-type sockets is to solder standard phone-cord tips to the short prongs. This is a simple matter for anyone having an electric soldering iron. Tin the inside shank of the phone tip and also the short prongs of the tube. Slip the phone tip over the tube prong and place the hot iron against the tip. It will not require much heat to make the two adhere, and when this is done to all four tube contacts, the tube may be slipped into the new X-type socket without any trouble. It is essential that the contacts in the socket make the right connections with the tube prongs, that is, the grid prong must connect with the socket contact carrying the grid-circuit connection, etc. This information may be obtained from any instruction sheet furnished with the standard tubes. If this is not handy, take an extra X-socket and push the tube into it. You will then note that the filament contacts are under the large holes in the socket. Most of the newer X-type sockets have a small engraved arrow pointing to the grid post, and in this case the tube is pushed into the socket with the pin on the side of the base in line with the arrow.

Umbrella Aerial

Several types of aerials are now on the market, which are designed to occupy little space, and most of these are in the form of a conducting device such as a ball, sheet of copper or brass, or a wire coil mounted on a standard, which in turn has a special base permitting it to be fastened to the roof. The "umbrella" aerial shown in the drawing also belongs to this class. It has a 100-ft. length of wire wound over the insulated ribs and is collapsible, permitting it to be dismantled when moving to a new location. As it requires very little space, it is especially useful to radio owners living in apartment buildings. Greater selectivity than that of a straight-line aerial is claimed for this type, and it has no directional qualities. No guy wires are needed to hold it in position and the outfit comes complete.



Facts and Fads for Radio Fans

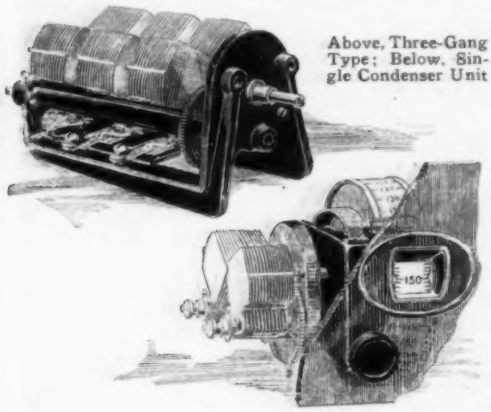
Upper Left, Capt. Paul Edwards of U. S. Signal Corps with New Transmitter for Communication between Ground and Planes in Flight; Above, Miss Mary Texanna Loomis, President and Lecturer of Loomis Radio College, Demonstrating One of Her Transmitters

Built for Experimental Purposes, This Large Horn Employs a Ten-Foot Air Column and Is Made of a Plasterlike Composition; It Is Claimed to Reproduce with Fidelity Both Bass and Treble Notes

Ray Hurling, Owner of the Trained Seal, Persuaded His Pet to Address the Radio Audience of Station WEEI at Boston; Bob Emery Is Holding the Microphone

Twin Rotor Condensers in Gang Form

Several new adaptations of twin rotor variable condensers are now available for the radio builder. This popular type of condenser is unique in that both sets of



Above, Three-Gang Type; Below, Single Condenser Unit

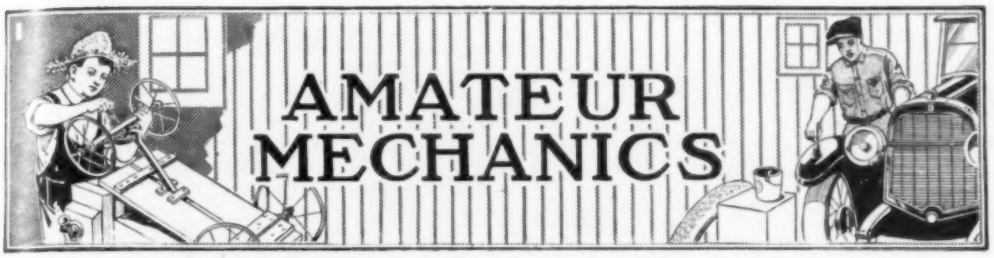
plates rotate, being driven by bakelite gears. This construction results in complete insulation of the dial shaft from the plates, allowing the dial to be grounded, and eliminating body capacity effects. The three-gang type, shown above at the upper left, is mounted on a frame of die-cast aluminum with black crystalline enamel finish; special staggered connections of plates make it self-shielding, preventing interstage coupling. The lower sketch shows a single condenser of the same type fitted with a special drum dial; the drum carries easily mounted calibration strips upon which station call letters may be written. This drum is rotated by means of the small knob shown at front, a spiral gear giving quiet operation without backlash. A socket and lamp are furnished for illuminating the dial at front; the dial-indicator plate is easily mounted.

Disposing of the Hot Soldering Iron

One of the most useful tools for the radio builder is the electric soldering iron, but, since this very necessary tool gets hot on the tip and stays hot, it must be carefully handled. It must not be carelessly disposed of when not in immediate use, but some sort of stand should be devised to support the hot tip above the surface of the table. Crossed nails, driven into a block of wood, make an efficient temporary stand, but a stand of this type leaves the hot tip exposed, and there is danger of the hand coming in contact with it, or of damaging some near-by material. A simple method of keeping the tip out of the way is to bore a hole through the work table near the front edge and drop the hot portion of the iron through this hole when it is not immediately required, the handle supporting the tool. The hole should be plenty large enough to pass the copper tip and shank, but not the handle, and in this position it is out of the way but readily accessible. Another point well worth remembering is to turn off the current when the iron is no longer required; absent-minded experimenters have been known to leave the current on unnecessarily many hours at a stretch; this is not only a fire hazard but is decidedly bad for the iron. A simple method of overcoming this difficulty is to install a socket and switch on top of the table in plain view, then use a two-way socket in the first one, employing a pilot lamp in one side and plugging the iron in on the other side. The lamp burning is a constant reminder that the iron is hot.

Bottle Makes Battery Filler

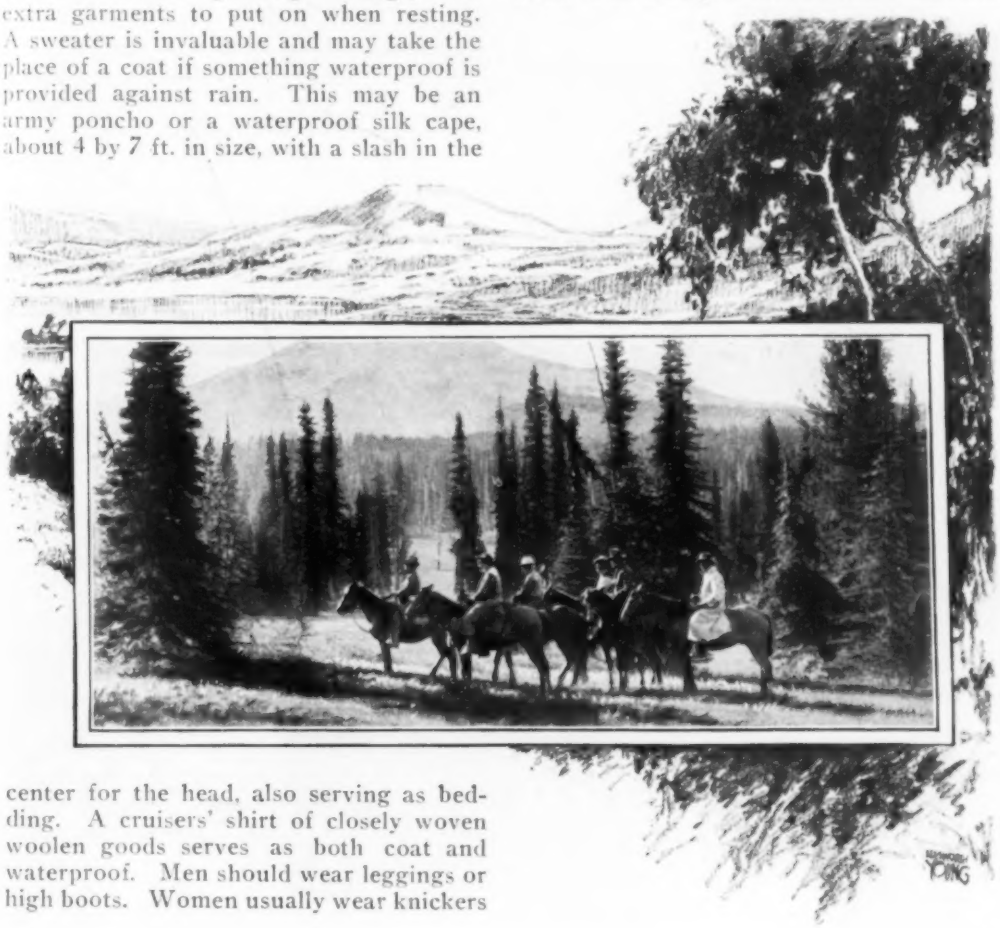
An ordinary bottle, with two glass tubes extending through the stopper, makes a handy device for adding distilled water to storage A and B-batteries, especially B-batteries. The cork or rubber stopper is drilled for the tubes, which are bent as shown by holding them over a hot flame until soft. The bottle may be held in an inverted position and no liquid will run out of the delivery tube while the end of the air tube is closed by holding the thumb over it. The amount of water added to each cell can be easily controlled.



The Tricks of Camping Out

By EARLE W. GAGE

FOR summer camping or hiking, elaborate clothing supply is an incumbrance. For a short trip, special clothing is unnecessary. Old things will do. If outing clothes are bought, they should be of rain-shedding duck, khaki or forestry cloth. Better travel in lightweight things, with extra garments to put on when resting. A sweater is invaluable and may take the place of a coat if something waterproof is provided against rain. This may be an army poncho or a waterproof silk cape, about 4 by 7 ft. in size, with a slash in the center for the head, also serving as bedding. A cruisers' shirt of closely woven woolen goods serves as both coat and waterproof. Men should wear leggings or high boots. Women usually wear knickers and high boots, but bloomers and short skirts will do; an outing shirt is better than a middy blouse, and woolen shirts are better than cotton, except in very hot weather. Underwear should usually be medium-weight cotton or lightweight wool. Felt hats give best all-round service.



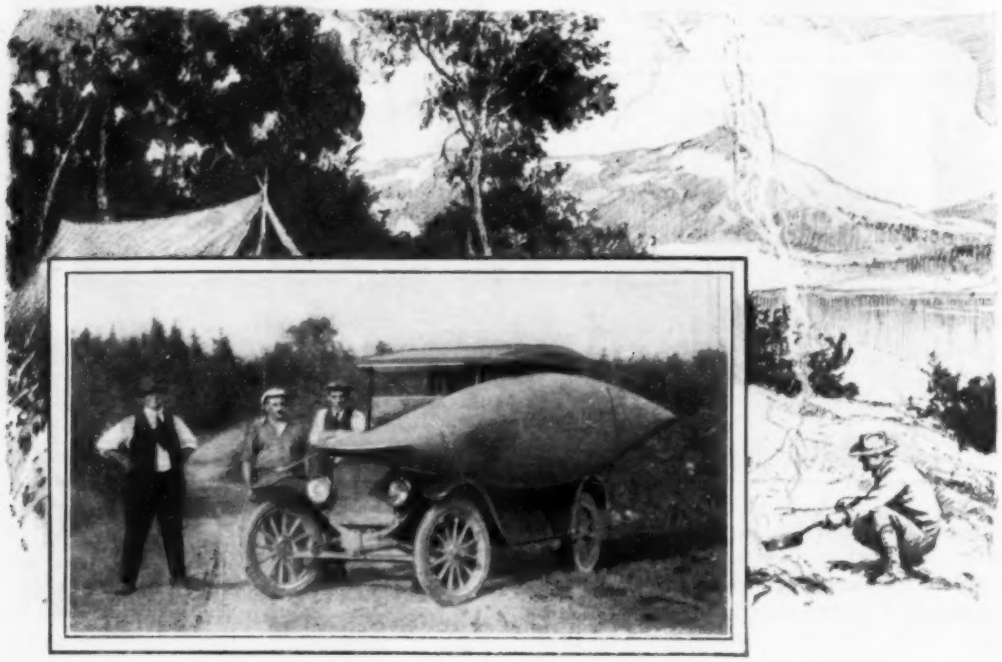
Buckskin gloves, without cuffs, are good for working around camp and to keep off mosquitoes, but hop pickers' canvas gloves will do. It is also a good idea to take along a yard or two of mosquito netting, especially in the mountains or for sites near low water.

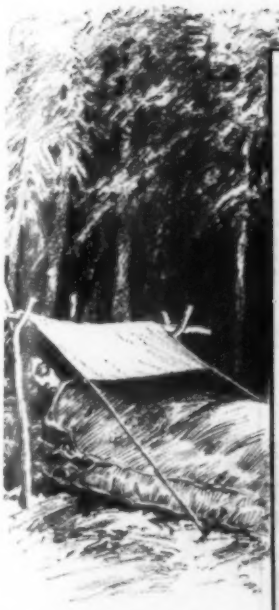
Footwear is most important of all. Comfortable shoes and wool socks are absolutely essential. The uppers of the shoes need not be of the heaviest weight but the soles should be thick, as they keep the feet from tiring and hold hobnails, important because soles become slippery on forest trails. New shoes should be broken in before starting, for blisters are dangerous as well as painful. Avoid narrow heels. If your ankles turn in or out, running your shoes over, buy side plates that screw to the heels and stiffen the counters. Instep and ankle straps, buckled outside the shoes, are excellent in steep country to prevent jamming the toes and blistering the heels. Always have insteps tightly laced. If, after all, heels slip and blister, ram with a stick as much cotton or moss as you can force in between the ankle and heel on both sides. This prevents slipping. Moccasins will be found restful after a hard day's hike.

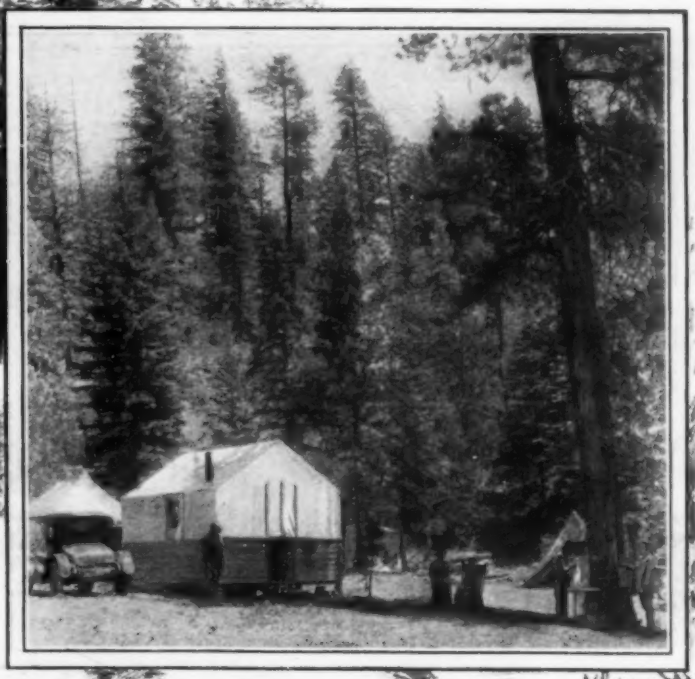
Trunks, suitcases, grips and satchels should never be taken on extended camping trips; the rough usage incident to camping will soon ruin them. Aside from this fact, they are very inconvenient to handle, especially if pack horses are to be used for transportation.

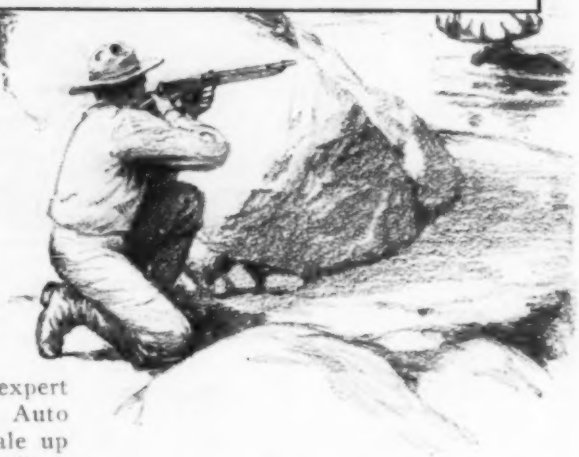
Extra clothing and other personal equipment are best carried in a heavy canvas bag, known as a "duffle" bag, which can be purchased from any firm handling sporting goods. Such a bag is fitted with a canvas loop or handle at one end and another at the side; the top has an inside hood, which should be waterproof, and the bag is shut with a drawstring or bar lock which is passed through eyelets at the open end.

A tarpaulin is used as a protection for the bedding when the latter is rolled into





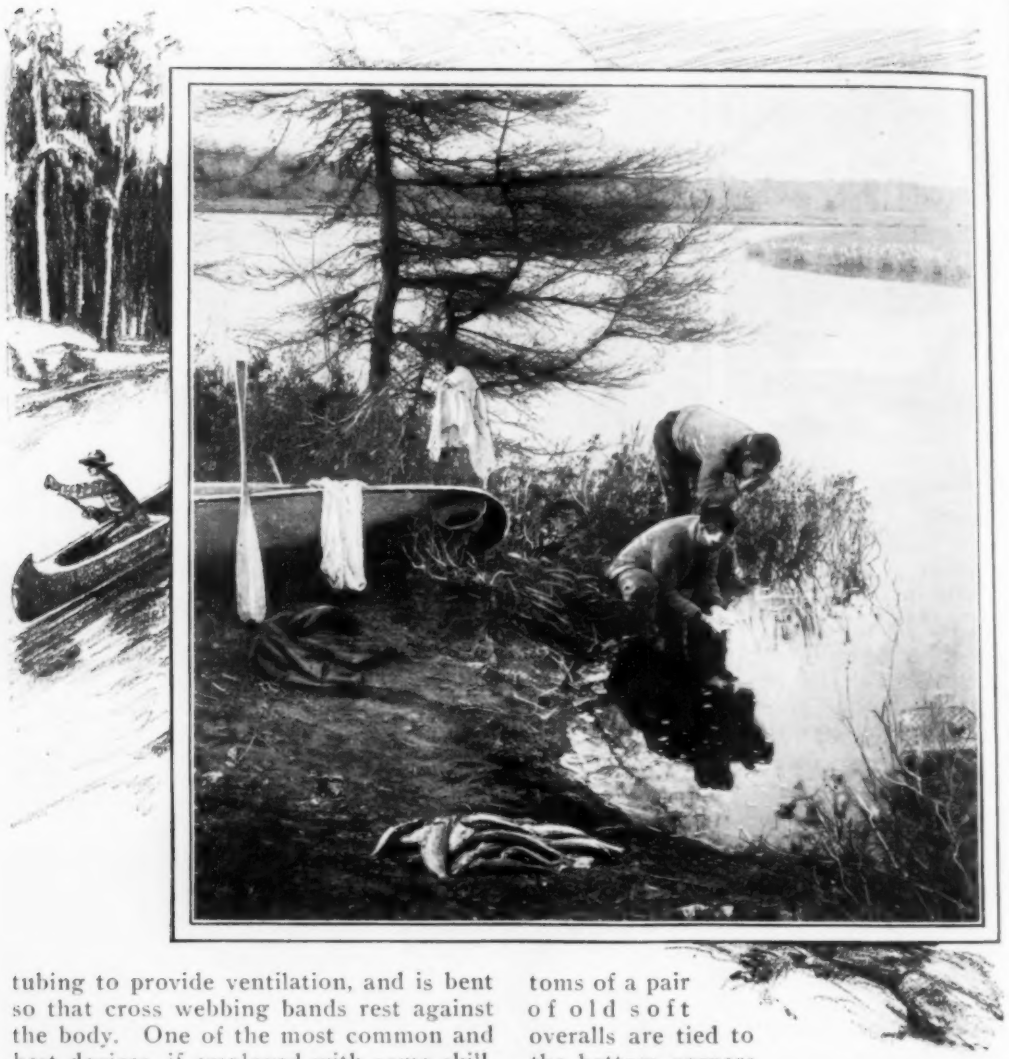




a pack or made up down on the ground. The best size is 11 by 15 ft., or the same size as a regulation wagon sheet or cover. It should be of not less than 8-oz. duck, and should weigh approximately 10 lb. No waterproof blanket need be included in the bedding if a good grade of tarpaulin is used. A 30-ft. length of ½-in. manila rope is used to tie the bed for packing.

Amateurs cannot handle or care for pack animals and should never attempt a trip on which they are to be used without employing an expert packer as well as a complete outfit. Auto equipment may be had on any scale up to running-board kitchens and trailers, special beds and tents. Gasoline or kerosene stoves are labor-saving and practical except for heavy cooking and baking, obviating wood rustling and trouble with fire wardens. The prime requisite of all auto equipment in connection with the food supply is that it be dust-proof. All covers should overlap and close down on felt straps. Plenty of canvas covering is also a good thing to use.

For back packing in the woods, there are four standard devices, their relative superiority being much a matter of personal opinion. The canvas pack sack with straps is simple, easy to load and can be bought in any size or quality. Its chief defect is that it is rather inadjustable to the shape and weight of the load, which likely will rest too low on the back. Packs should always ride high. The pack board is a flat wooden frame with shoulder straps. The load is lashed to it or suspended in a sack into which the frame is built. A variation of this form is one made of hollow



tubing to provide ventilation, and is bent so that cross webbing bands rest against the body. One of the most common and best devices, if employed with some skill, is the old-timer's bedroll. The blanket is folded lengthwise, until it is about 2 ft. wide, with the edges lapping over the food and small articles, which are first laid compactly in the center and near one end. The roll is begun at this end to form a cylindrical bundle, with all the hard articles in the center. Straps or cords around each end hold it firmly, and to these the shoulder straps are attached, together at the top and separated a foot or more at the bottom, to prevent swaying. Sometimes the roll is put in a sack before strapping.

Gunnysacks and overalls furnish a variation of the above system and this equipment is preferred by many. The leg bottoms of a pair of old soft overalls are tied to the bottom corners of a gunnysack with a chip or pebble in each corner so that the string will not slip off. The load is placed in the sack, the top of which is gathered down as close to the load as possible and there lashed with a string to the overalls, which are gathered exactly at the crotch. The legs form the shoulder straps, and the waist is spread back over the pack to shed rain.

Always use some method of suspending even a light pack from both shoulders. Anything on one shoulder, even a long slender blanket roll, is very tiresome. See that the shoulder straps are not too wide, narrow, tight, loose or hard. Keep the pack as high as possible without binding the

arms or the chest, or it will tip back and hit the small of the back, and also tire you by swaying.

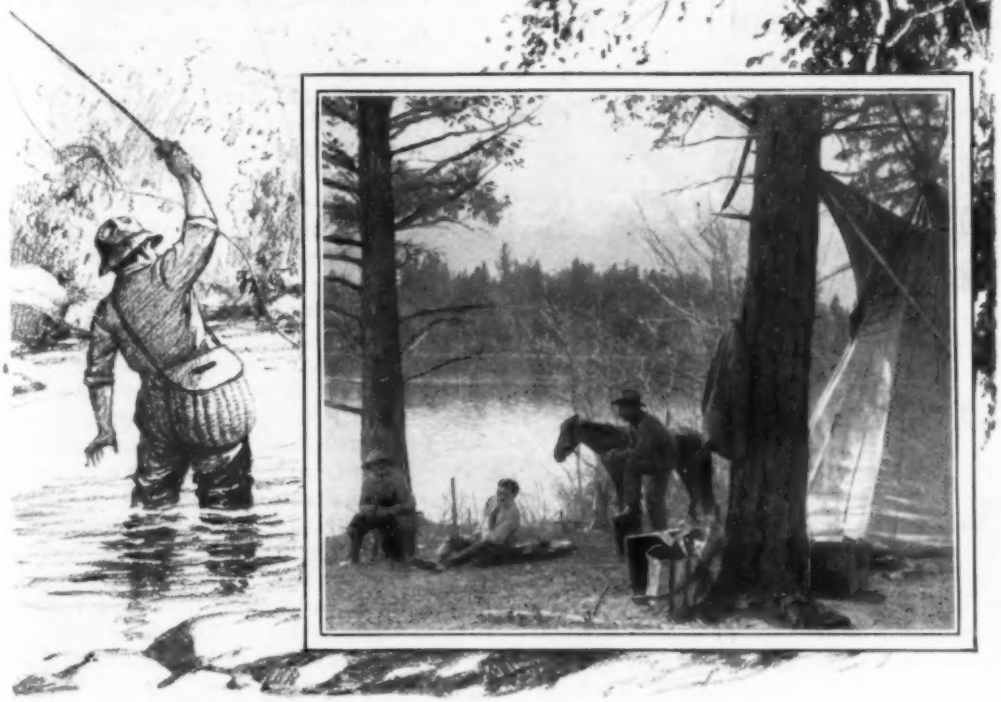
Next to the badly slung pack the commonest errors are too much load and too much speed. Avoid non-essentials and duplicate articles in the party. Anything above 25 or 40 lb. is too much to carry conveniently. A four-day trip can be made comfortably with less than 30 lb. Always travel slowly and rest often.

The most important thing to consider when choosing a camp site is the supply of water. This is absolutely essential except at temporary camps, where water is provided in barrels or canteens. When a camp is to be more or less permanent, it should be located at a point far enough away from the source of water supply to prevent its contamination from camp refuse, if this is allowed to accumulate. Refuse should always be burned or buried, as it attracts flies and other insects.

Fuel is the next important item to consider. Ordinarily, where camps are established in wooded regions, there will be found sufficient dead wood for all heating or cooking purposes. But if no wood is available and a camp is to be made in the open country, dry stock manure will prove an excellent substitute. This is the fuel the old-time pioneers used when crossing the prairies, where they sometimes saw no trees for months.

The accessibility of the camp must also be taken into consideration. If equipment and supplies are to be transported by means of wagons, it is especially desirable to have the camp located at a point which wagons may reach without difficulty and where there is plenty of room for backing or turning them about. The camp may, however, be located in a much rougher place, if pack animals are to be used to carry the equipment and supplies. In either event, it should be so located that it will provide easy access.

After the questions of water, fuel and accessibility have been satisfactorily settled, the one



of protection should be considered. Winter camps located on northern slopes, which have little sunshine or are covered with heavy timber, are usually dreary and uncomfortable. On the other hand, summer camps located on bare, exposed south slopes are also uncomfortable. When camps must be established in country where stock grazes at large, it is always advisable to construct some sort of fence around the tents.

(To be continued)

Carrier for Firewood

When wood has to be carried into the house from a wood pile in the yard, the

Convenient Method of Carrying Firewood without Soiling Clothes

task is rather unpleasant, especially during rainy weather. The provision of a carrier of the kind shown in the drawing will be found to lighten the work considerably and it will also protect the clothes to some extent. The handle consists of a 30-in. length of old curtain pole or broomstick. The crossbar is a piece of 2 by 4-in. wood. Barrel hoops can be used for the side bars, but 34-in. lengths of strap iron, bent as shown, will be more satisfactory. Two holes are drilled in the middle so that the side bars can be securely screwed to the cross member.

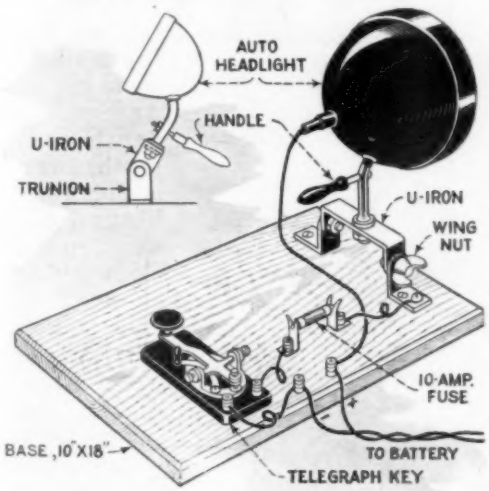
Casein Glue

Casein glues are splendid for woodworking, for making cardboard articles, and when the composition is varied somewhat, make excellent cements for china and metals. To make the glue, soak a quantity of casein powder two hours in an equal weight of hot water. To this gummy mass add one-seventh the weight of the casein in borax, which has been dissolved in very little hot water. Stir until all is dissolved after mixing borax and casein. This can be thinned with water to suit and is a good glue, but it can be made more adhesive by the addition of a little sodium arsenate. Any alkali, such as soda or ammonia, can be substituted for the borax. To make a china cement, lime or water glass should be substituted for the borax. Addition of burnt magnesia increases the speed of hardening.

Electric-Light Telegraph

While radio is the modern means of code transmission, even the simplest sending set is costly and needs a special license to operate it. For the boy who wishes an efficient and inexpensive telegraph system, one can be built that will transmit messages over a considerable distance. Government experiments have shown that a common auto headlight will transmit readable signals for over 150 miles, so, with two outfits similar to the one shown in the illustration, signals can be sent and read by two operators miles apart, as for instance across a wide harbor or lake, or between two hilltops. Such transmission must necessarily be done at night, and, by employing lenses that will shoot a narrow beam, messages can be confined to a fairly straight line and not be noticeable out of the line of the light. A 32-cp. bulb and a storage battery can be used. The outfit is constructed as follows: Make a heavy wooden base, at least 18 in. long and 10 in. wide. Near the right end, fasten a common telegraph key. Some space

should be left to the right and in front of the key for the operator's hand. Then, at the left and about 3 in. from the end, mount two metal trunnions as indicated. These are merely angle irons with a pivot hole in the center of the uprights. They can be made from any fairly stiff metal. Place them 4 in. apart and between them pivot a wide U-shaped piece with a hole in the center of the horizontal side into which the threaded end of the headlight shank is fitted. Two washers and a nut serve to hold it in place but allow sufficient play so that it can be turned if desired. The U-iron can also be swung forward or backward, and is locked by a wingnut on one of the pivot bolts. Drill the light shank as suggested, and insert a handle for turning the light. Place two binding posts on the baseboard and wire one to the key. The other key terminal is wired to a 10-amp. auto-light fuse in a spring-clip holder fastened to the baseboard, and the other end of the fuse is then wired to the trunnion. The other binding post is wired direct to the bulb socket in the light. Mount the whole affair suitably near a window or outdoors on a tripod. Connect the battery to the binding posts and you are ready to send. Pressing the key for a short or a long time makes dots or dashes of light. Direct the light toward the desired point, lock it in place, and the beam will travel straight to your correspondent at the receiving end.



Using Auto Headlight and Telegraph Key to Flash Messages by Rays of Light

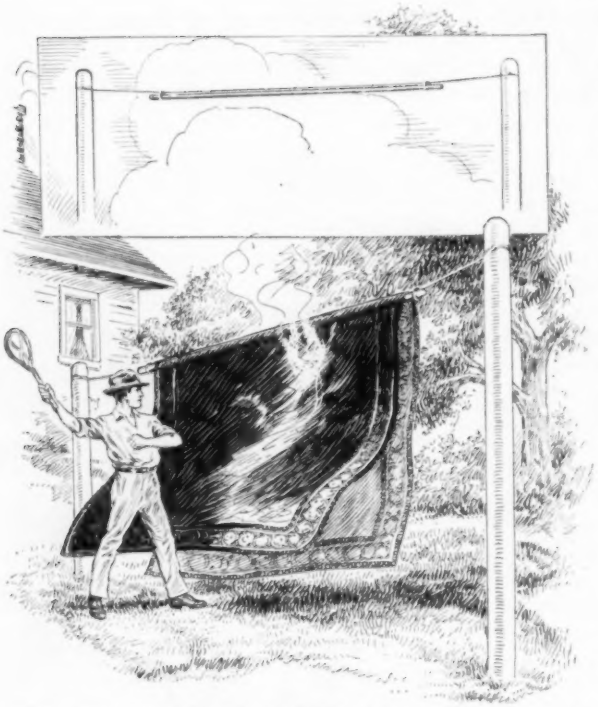
Dolly Aids in Landing Small Boats

Dragging rowboats or canoes along a dock or float is hard work, and is also injurious to the bottom of the boats. A dock tender at a yacht club overcame all this trouble by building a dolly for the purpose, as shown in the illustration. Two boards, 12 in. long and 6 in. wide, were beveled along one long edge and screwed together. A V-shaped block was fastened in one end and two pieces of flat iron were bolted to the sides, about 4 in. from the end block. The lower ends of these were drilled and fitted with an old skate roller. When a boat was to be moved it was lifted by the stern and the dolly slid in under the keel. The weight of the boat held it in place as the keel pinched down into the "V." It could then be easily wheeled in any direction.—L. B. Robbins, Harwich, Mass.

Handy V-Shaped Dolly with Roller-Skate Wheel for Moving Rowboats

Outboard Motors as Baggage

According to the western association of general baggage agents, outboard motors, regardless of how they are packed, must be shipped by express, and cannot be checked as baggage.



Clothes Pole Attached to the Line Holds Rug in Place Evenly So That It Can Be Beaten More Efficiently

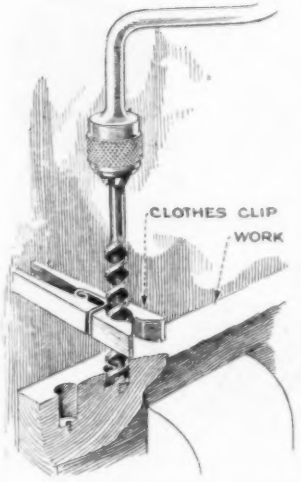
Non-Sagging Clothesline for Beating Rugs

When a heavy rug or carpet is thrown over the clothesline for beating and cleaning, it usually causes the line to sag, wrinkling the rug so that the work cannot be efficiently done. To avoid this we attached two small wire hoops to our clothesline, as shown in the illustration. These, when not in use, are slid back to drop over the poles supporting the line. When a rug is to be cleaned, the hoops are drawn out and one slipped over each end of a clothes pole. The rug is thrown over both line and pole and will then hang smoothly and evenly. —G. E. Hendrickson, Argyle, Wis.

Assembling and Hanging Electric Fixtures

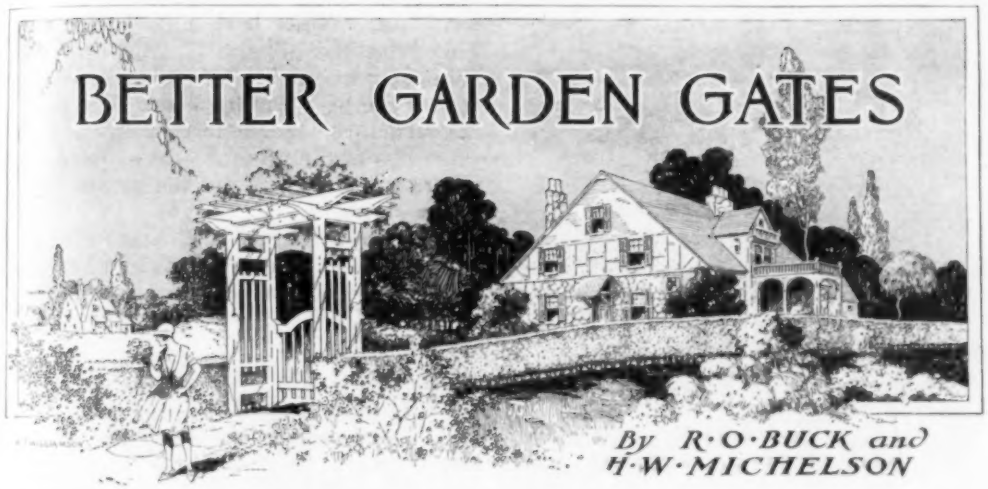
After unpacking fixtures that are to be wired and hung from the ceiling, see that all the parts are put together, then wire the parts of the sockets and assemble them. Never use wire smaller than No. 18 stranded fixture wire, with rubber insulation, for the arms and chains of the fixture. Also note that No. 16 gauge of such wire is used as a feeder of two or three lights, and No. 14 gauge as a feeder of four or six lights. Be sure that all joints are mechanically tight. They are twisted in pig-tail fashion and are soldered and taped. To make a good tape joint, take a piece of friction tape, about 4 or 5 inches long, place it between the connected wires and wind it around them once. Then take 2 in. of rubber tape and bind it around the joint, then over and lap it back to the beginning of the joint to make the tape firm. It is also a good plan to paint the joint with insulating paint over the tape. Be sure to test out the fixtures after they are wired for bad sockets or bad insulation in wires, caused by burrs and sharp edges in the pipe or fixture parts. Bare wire touching the fixture will sometimes cause a short circuit. Always use heavy wood screws to fasten the crowfoot or base of the fixture to the ceiling; the screws should project through the plaster laths and into a support board provided above them. Heavy fixtures and ceiling domes should always be hung from fixture hooks screwed into the joists or fastened to bridging between the joists.—J. W. Wright, Hudson Falls, N. Y.

Spring Clip for Depth Gauge



When boring holes in wood to a predetermined depth and a depth gauge is not available, an ordinary spring clothespin can be used for this purpose. It is attached to the bit as shown and can readily be adjusted, serving just as any gauge especially made for this purpose.—Chas. Illingworth, Vancouver, Can.

BETTER GARDEN GATES



By R·O·BUCK and H·W·MICHELSON

WOULD a bit of landscaping change your house and lot into a home, in the true meaning of the word? A place of beauty and comfort, that is pleasant and restful to the eye, and which gives one that feeling of pride that only a beautiful home can give? An attractive and convenient house, whether new or old, cannot accomplish this purpose alone, but add to this a flower garden, one or two garden structures, green lawns, well placed trees and shrubs and, perhaps, a lily pool, and one cannot fail to produce an appealing and altogether delightful place in which to live.

There is an added pleasure in a home when much of the beauty and convenience are the result of one's own handicraft. When one can so easily add to the beauty and comfort, as well as monetary value, of one's home and at the same time derive pleasure and profit from the small expense and labor involved, it needs but the inspiration, with some few hints and general information in regard to good design in lines and proportions, to begin a structure for our home beautiful.

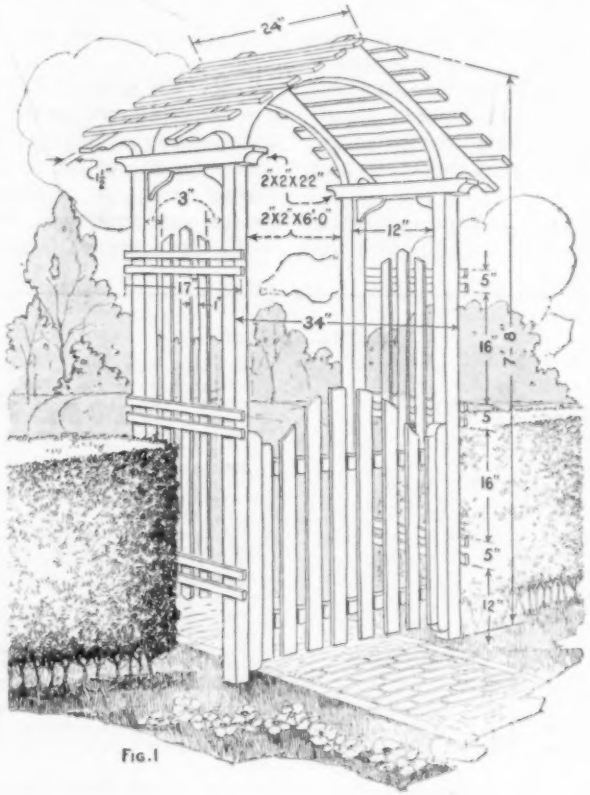


FIG. 1

The three designs for inclosed garden gates illustrated herewith are all well within the ability of the average home owner. Only the ordinary tools are needed, as difficult and tedious joint making has been largely eliminated. Practically all of the material can be obtained, dressed to width and thickness, from most lumber dealers.

The lumber to be used for garden structures should be

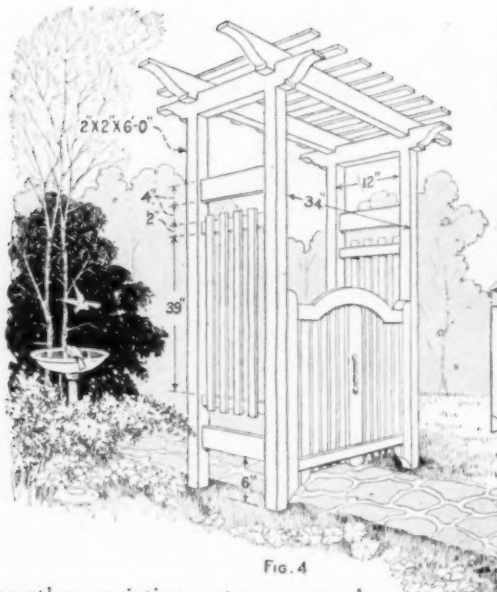
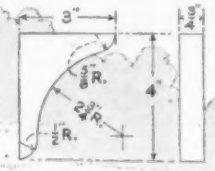


FIG. 4



BRACKETS 4 REQ.
FIG. 3

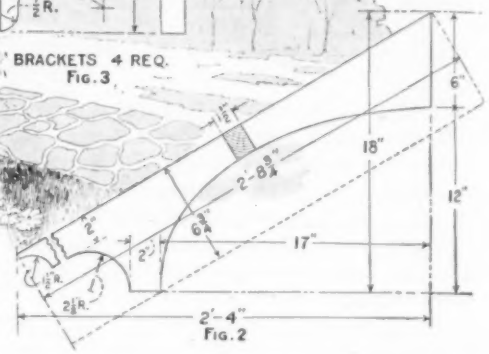


FIG. 2

weather-resisting, strong and straight-grained, as it is subjected to extremes of temperature, wind and rain and sometimes to other abuse. Southern pine, cypress or redwood all fulfill these requirements admirably. If you live east of the Rockies you will probably find pine the most easily obtainable. All of the material should be dressed on all sides and the ends smoothed for painting, to prevent the entrance of moisture and consequent decay.

All the pieces should be cut to size and given a priming coat of paint before assembling. White lead, mixed with pure boiled linseed oil and a little drier and thinned with plenty of pure turpentine, makes the best priming coat. The life of the structure depends largely on the thoroughness of the priming coat as the places where the pieces lap are the points where decay starts.

After the structure is all assembled and set up, it should be given two coats of a good-quality outside paint. White or pale cream are the preferred colors for garden structures, though a brown creosote stain which preserves the wood, or an aged effect produced with acid, is very effective also in proper surroundings.

Eighteen inches is added to the length

MATERIAL LIST

For Fig. 1
4 corner posts, 2 by 2 in. by 7 ft. 6 in.
4 rafters, 1½ by 7 in. by 2 ft. 4 in.
2 purlins, 2 by 2 by 22 in.
2 posts, 2 by 2 in. by 3 ft.
12 lattice, ⅜ by 1⅜ in. by 2 ft.
4 brackets, ¾ by 3 by 4 in.
12 cross lattice, ⅜ by 1⅜ by 17 in.
6 vertical lattice, ⅜ by 1⅜ in. by 4 ft.

For Fig. 4
4 corner posts, 2 by 2 in. by 7 ft. 6 in.
2 rafters, 2 by 4 in. by 4 ft. 10 in.
2 purlins, 2 by 4 in. by 2 ft. 5 in.
7 lattice, ⅜ by 1⅜ in. by 2 ft. 8 in.
2 posts, 2 by 2 in. by 3 ft.
4 rails, 1 by 4 by 12 in.
4 rails, 1 by 2 by 12 in.
8 lattice, ⅜ by 1⅜ in. by 3 ft. 9 in.

For Fig. 6
4 corner posts, 2 by 2 in. by 6 ft.
2 purlins, ¾ by 3 by 10 in.
1 roof slat, ⅜ by 1¾ by 19 in.
2 roof slats, ⅜ by 1¾ by 13 in.
2 roof slats, ⅜ by 1⅜ by 13 in.
2 roof slats, ⅜ by 1¾ by 11 in.
2 roof slats, ⅜ by 1⅜ by 18 in.
20 roof and side slats, ⅜ by 1⅜ by 10 in.
2 posts, 2 by 2 in. by 4 ft. 6 in.
Also material for rafter segments.

For Fig. 10
2 cross slats, ¾ by 2 in. by 2 ft. 6 in.
8 vertical slats, ¾ by 2 in. by 3 ft. 3 in.

For Fig. 11
2 rails, 1½ by 3 in. by 2 ft. 10 in.
1 rail, ¾ by 3 in. by 2 ft. 6 in.
1 rail, curved, ¾ by 7 in. by 2 ft. 6 in.
1 slat, ⅜ by 5 in. by 2 ft. 11 in.
6 slats, ⅜ by 2½ in. by 2 ft. 10 in.

For Fig. 12
2 vertical rails, 1⅛ by 1½ in. by 3 ft. 6 in.
2 cross rails, 1⅛ by 2 in. by 2 ft. 6 in.
1 curved rail, 1¼ by 9 in. by 2 ft. 6 in.
4 vertical slats, ⅜ by 1⅜ in. by 3 ft. 6 in.
5 vertical slats, ⅜ by 1⅜ in. by 2 ft. 6 in.

Climbing roses, wistaria or other colorful vines should be planted on each side of the structure and trained to grow up the lattice and over the top.

of each corner post or leg of the structure to anchor it in the ground. This is not shown in the drawings but is taken into consideration in the stock bill. The portion below the ground should be well painted or tarred, especially on the end, to prevent the entrance of moisture. The legs should be buried in concrete. This is best accomplished by digging four properly spaced holes, about 6 in. in diameter and a few inches deeper than the post is to enter the ground. The bottom should be filled with a bit of concrete for the ends of the posts to rest on. After this concrete has partly set, the structure should be set in place and braced with laths, to act as stays, so that it is plumb. The holes are then filled with concrete a little above ground level. No form will be necessary for the concrete unless the soil is very loose or sandy.

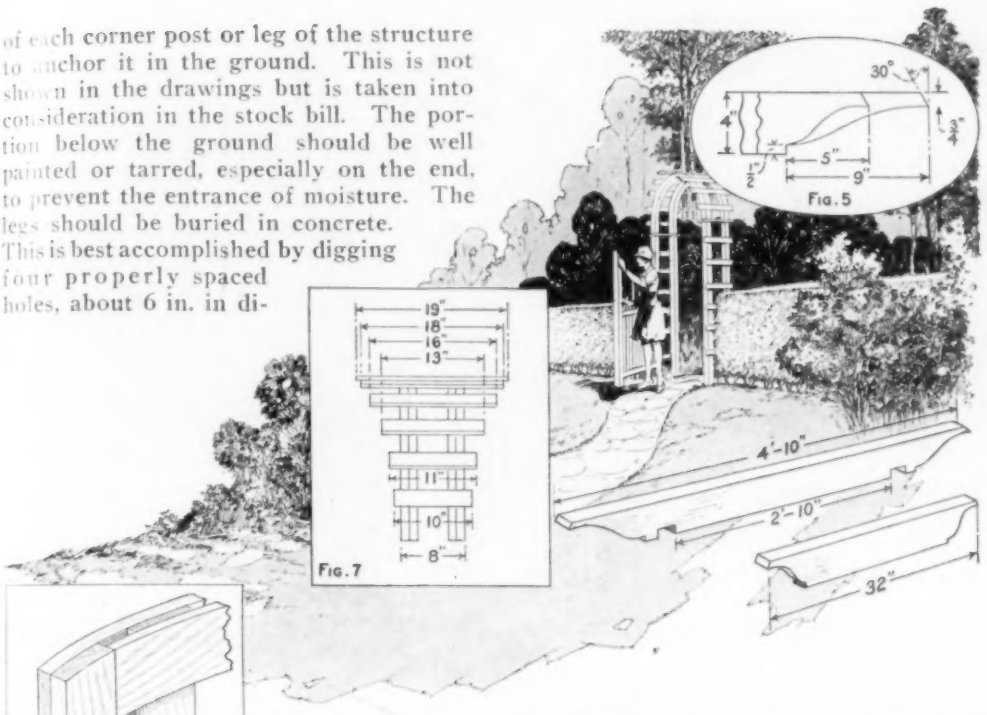


Fig. 5

Fig. 7

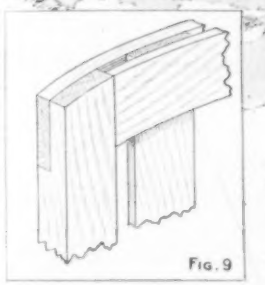


Fig. 9

Nails are used to fasten the parts together. If you wish to make a very nice job, you will use finishing nails, so that they may be set and the holes puttied, but this is not necessary. The lattice is fastened with fine two-penny nails clinched on one side. Brass screws, of course, make a better job.

The corner posts are shown doubled on the side where the gate is attached. This is a satisfactory method of reinforcing, but if the gate will be subjected to much hard usage, it might be well to hang it on a 4 by 4-in. post, set directly back of the corner post but unattached to the latter, so that the structure will not receive the vibration of the gate when slammed. A good sturdy latch with hinges of rustproof material, if possible, is suggested.

Lattice is carried in stock in most lumber yards in two standard sizes, ⅜ by 1⅜ in. and ¾ by 1¾ in. The sawing of some of the rafters and rafter ends may either be done on a bandsaw at the mill, or, if you prefer and don't mind a bit of rather hard work, cut with a turning saw.

Detail drawings, showing the shapes of

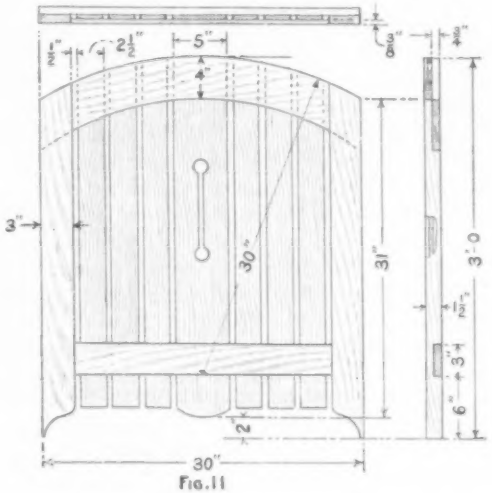
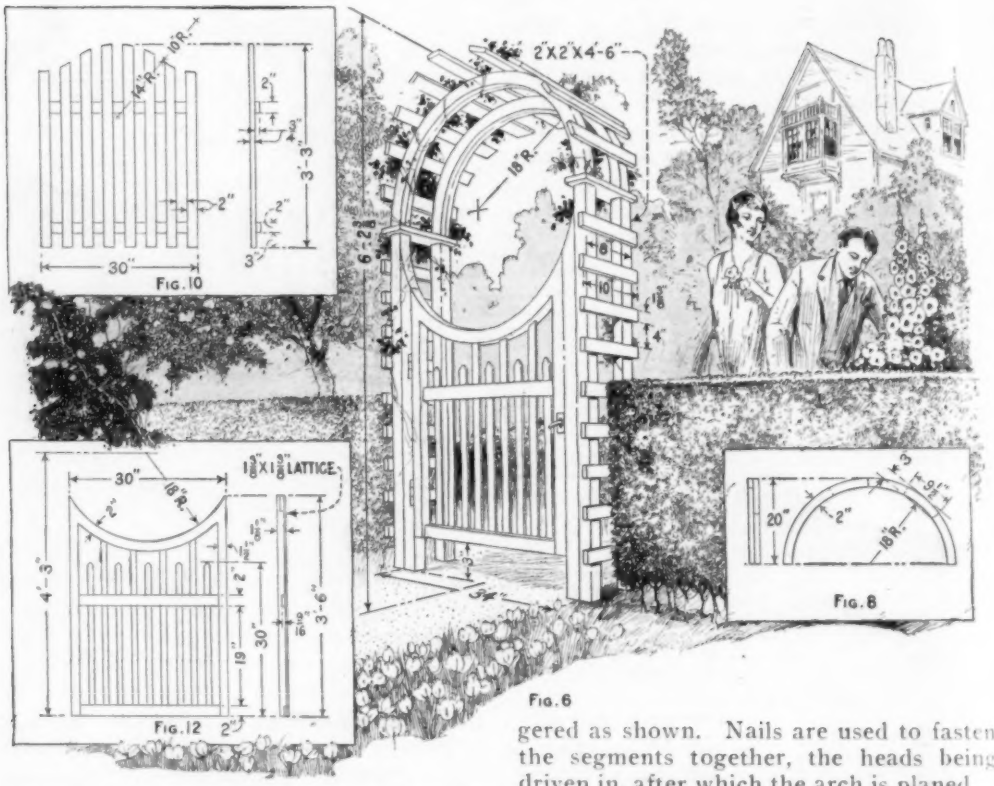


Fig. 11



the rafter ends and brackets as well as the gate construction, give you all the information necessary to construct any of the inclosures and gates in a workmanlike manner. As the gates are all the same size, they are interchangeable so that you may select one to go with your inclosure.

A little explanation of the detail sketches may not be amiss. Fig. 2 shows the size and shape of the rafters for the archway, Fig. 1, and Fig. 3, the brackets for the same project. It is advisable to lay out a full-size pattern of each of these pieces before cutting the stock. The dotted lines of Fig. 2 indicate the width of the stock.

Fig. 5 shows the shape of the rafter and purlin ends for the type shown in Fig. 4. No dimensions are given for the curves, which may be designed to your fancy.

Figs. 7 and 8 give details for the inclosure shown in Fig. 6. The varying lengths of the lattice over the top give a pleasing curve which is not very evident in the perspective sketch. Fig. 8 shows the method of building up segments for the arched rafters. The two layers consist of short sections, with the joints staggered as shown. Nails are used to fasten the segments together, the heads being driven in, after which the arch is planed.

The three types vary greatly in the degree of skill required to construct them. The one illustrated by Fig. 10, of course, is the simplest and most easily constructed. By changing the curve at the top this general arrangement may be used for any of the gates. The joints are all of a simple butt-nailed type and require only care in nailing. The curve should be laid out and cut after the gate is constructed. Housed or half-lap joints are used on both of the others, as shown by Figs. 11 and 12. Fig. 9 is an enlarged detail of the joint.

How to Make a Taper Ferrule

Having occasion to make a taper ferrule of irregular form, a pattern from which to cut the material was made as follows: A mandrel of the desired shape was made, a piece of writing paper, soaked in water, wrapped around the mandrel, and a piece of twine wound over it, coil after coil like the thread on a spool. This was allowed to dry thoroughly, using a little heat. The string was then removed and a longitudinal cut made in the paper while on the man-

drel. When opened, this paper formed the pattern. A piece of metal was cut from the pattern and the edges were brought together and brazed with spelter. The point of the mandrel was driven through a piece of block tin, about ½ in. thick. The mandrel was then removed, the ferrule was placed on it and both started in the hole in the tin and driven through it. As the mandrel with the ferrule passed through the tin, the metal was shaped exactly to the mandrel. It is best to oil the hole in the tin.—James Beebee, Rochester, N. Y.

Improved Diving Board

To give greater spring to a diving board, a group of boys used a set of auto springs which greatly increased the height to which a diver could jump. Two posts, with crosspieces at the bottom to prevent them from pulling out, were buried securely in the bank, as shown in the drawing. A bolt, which fitted over the end of the plank, was connected to the tops of the posts, and two cleats held the spring board in place. Two smaller stakes in front supported a crosspiece upon which the springs were mounted. A little adjusting was necessary before the proper position for the springs was found. Divers who have used the board claim that the action of the board when thus equipped is different.

Discarded Auto Springs Improve Spring of a Diving Board So That Height of Jump Is Increased

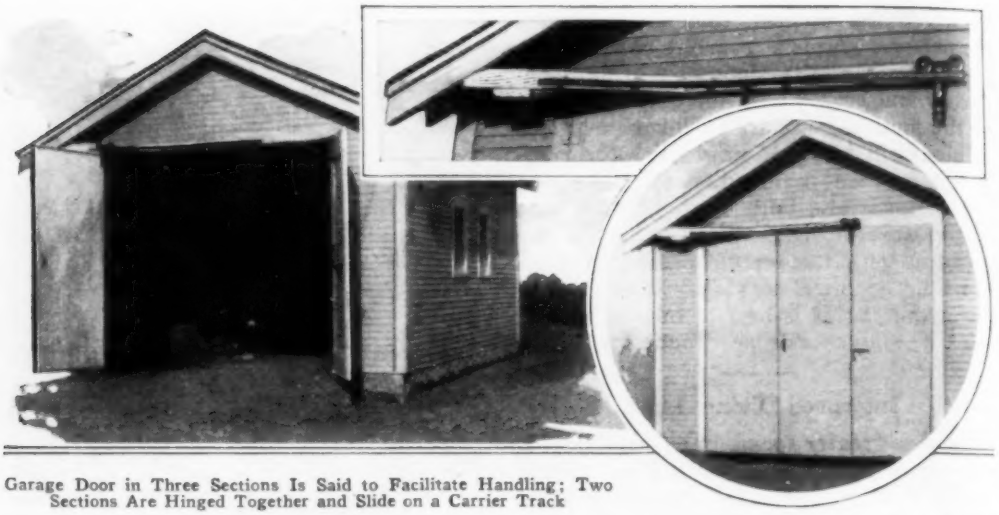
Gas and Electric Meters Arranged in Basement Window

Handy Place for Meters

When installing the gas and electric service, I arranged to have the meters placed near a basement window so that they could be read by the inspectors from the outside. This overcomes the annoyance of admitting them, which is especially objectionable when they have wet and muddy feet. Besides, in this way, they can always read the meter, whether there is anybody at home or not.—Mrs. R. A. Jessen, Keansburg, N. J.

Repairing Worn Escapement Wheel

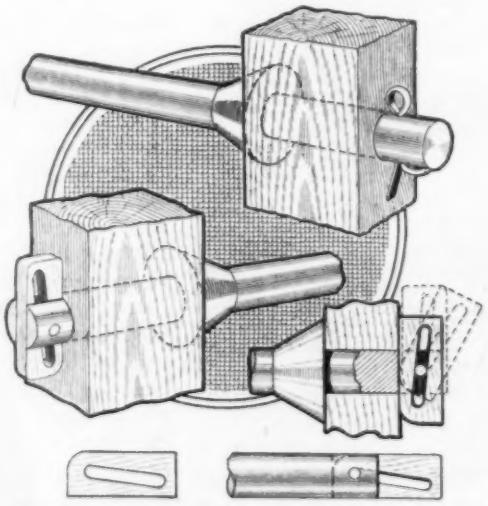
When a clock has served its usefulness and is apparently worn out, the jeweler's price to overhaul it frequently amounts to almost as much as the original purchase price. One weak place in the clock is the escapement wheel. The points soon wear down, thereby producing a greater escapement and pendulum movement, which results in an increased strain and wear of the clock. If the tips of the teeth on the wheel are bent up slightly with a pair of pliers, the swing of the pendulum will be reduced, thereby increasing the life of the clock. Many of the grandfather's clocks can be put in order in this manner so as to serve as timepieces.



Garage Door in Three Sections Is Said to Facilitate Handling; Two Sections Are Hinged Together and Slide on a Carrier Track

Novel Garage-Door Installation

This garage-door installation will appeal to the man who does not care to go to the expense of getting special fittings for his garage and yet wishes to have the installation stand up under constant use. In this case, three doors are used, all of the same width. Two of the sections are hinged together and one of these is hinged to the left side of the door opening. The third section is hinged to the opposite side. A short length of door-carrier track is mounted directly over the door, on the outside, with two-thirds of its length running parallel to the side of the garage. The other third is mounted on a 2 by 4-in. piece, which is set at a slight angle, approximately 12°, as indicated in the upper right-hand photo. A swiveled double-wheel support is mounted on the upper free corner of the two-unit door section so that it will ride along the track. A latch which can be locked at the top, is provided near the middle of this two-section unit. The third door swings to the right like any ordinary door. It is fitted with a latch so that it can be padlocked to insure safekeeping of the car.—Dale R. Van Horn, Walton, Nebr.



Quick-Acting Wedge Is Better Than Cotter Pin for Use with Portable Equipment

Wedge Fastener for Portable Equipment

Parts of portable equipment are usually held together by wingnuts or cotter pins, but both these methods have their disadvantages. Having occasion to build a portable outfit I used an idea of an old master blacksmith, which gives rigidity and allows quick assembling or dismantling. The upper detail in the illustration shows a rod fastened in place by a cotter pin. This not only allows play, but the ends of the pin must be spread for safety, with consequent difficulty in removing it. The wedge in the other figures will be found much more convenient. The end of the rod is slotted and a pin it fitted through it as shown, of such a size that the wedge, which is slotted slantingly, will just slide freely upon it. It will be noticed that the wedge is just as

wide as the diameter of the rod and that, when horizontal, it allows the rod to be inserted in a hole drilled to fit. When the wedge is turned upright, a light tap or two will drive it home snugly. Removal is just as easy. Thus, with quick positive action, a tight fit is assured and there are no loose parts to be lost.—Herbert C. McKay, Eustis, Fla.

Handling Sticky Flypaper

It is sometimes rather amusing to see someone trying to move or handle a piece of sticky flypaper, but when I had to handle it myself I found it very annoying. The paper flattens out when it gets warm and is hard to pick up; it seems to jump around like a grasshopper. The trouble was, however, easily overcome, by using a number of ordinary paper clips, bent at right angles and slipped over the edges. When it is necessary to move the paper, just take hold of the clips and it will not get away from you.—Frank W. Bentley, Jr., Missouri Valley, Iowa.

A "Bird Filling Station"

The novel bird house shown in the photo has appropriately been called a "Bird Filling Station." It is a duplicate, in miniature, of a gasoline-filling station, and is painted red and white. A wire basket is provided and filled with suet. The inside of the "office" is arranged so that grain

An Interesting Novelty in Bird Houses; Grain Drops Out Automatically as the Birds Feed

flows out onto the floor of the exterior as fast as the birds consume the first supply.—Geo. B. Dolliver, Battle Creek, Mich.

Gate Closes Automatically

Three horizontal bars used to provide passage through a fence from one field into another, are always certain to return to their original position after being weighted at one end and pivoted as shown in the photo. Although such a set of bars will not permit the passage of vehicles, there are many situations where they serve to maintain an unbroken fence line and yet allow persons on foot to pass without difficulty.—Orin Crooker, Elgin, Ill.

Novel Gate Permits Easy Passage of Persons and Drops Back into Position Automatically

Homemade Humidity Indicator

A simple weather indicator that may be used in determining the humidity of the atmosphere can readily be made. Dress a small figure in the form of a doll, with a piece of cloth, previously dipped in the following solution: chloride of cobalt, 30 parts by weight; sodium chloride, 15 parts; gum arabic, 7½ parts; calcium chloride, 4½ parts, and water 400 parts. This cloth will change color as the amount of moisture in the atmosphere changes, the change being due to the cobalt salt, which in dry air is lavender blue. As the humidity of the atmosphere increases the color changes first to bluish-red, then light red and finally pink, according to the amount of moisture. With a decrease in humidity, the colors change in the reverse order and the original blue color will return when the air becomes dry.

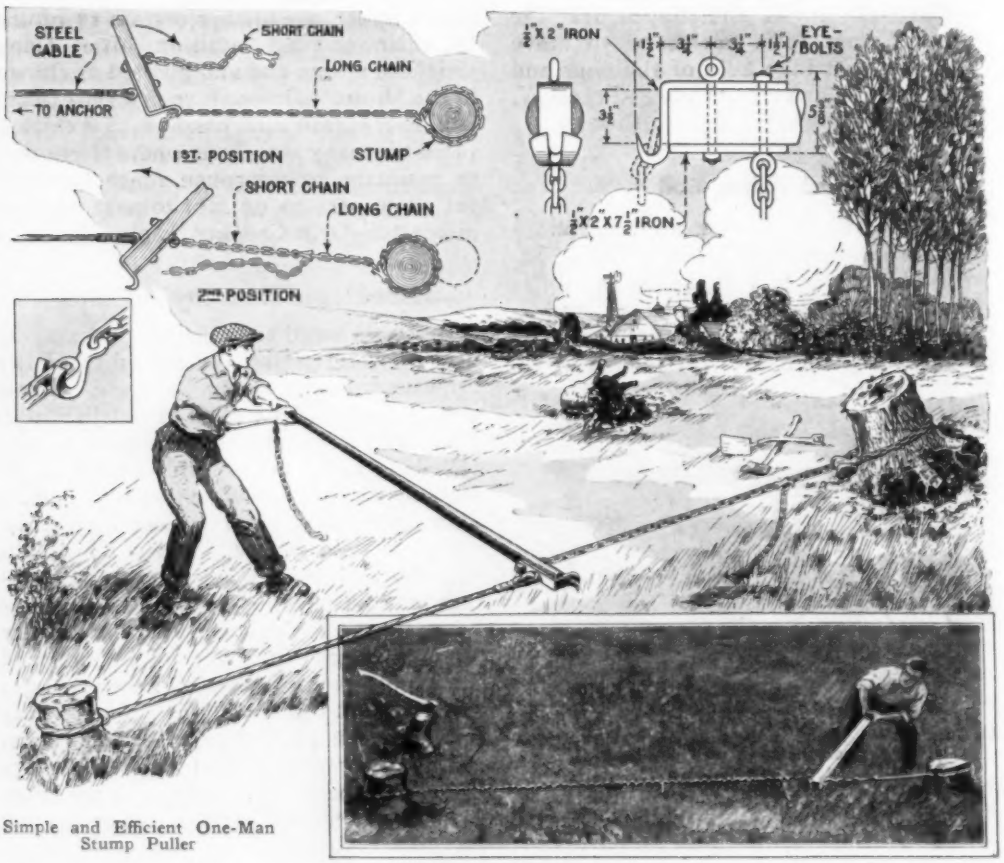
Effective One-Man Stump Puller

By CHAS. A. KING

PULLING stumps is always a more or less difficult task. Even with horses or a tractor, it is, at best, a slow process, to say nothing of the danger of cutting the horses' legs with the sharp ends of the roots. However, the writer's experience in removing hardwood stumps of 15 years' growth by hand, with the use of the stump puller described, has been very satisfactory.

A straight, dry hickory pole, about 10 ft. long and 3½ in. in diameter at the large end, was selected, though later it seemed that one somewhat shorter and smaller would have been heavy enough. The checks were carefully filled with wooden feathers glued in and afterward smoothed so that splinters would not endanger the hands, and several coats of raw linseed oil were applied and allowed to soak in.

A plate and hook for the end of the pole were bent to the shape shown and securely fastened by two eyebolts. A 15-ft. length of ⅜-in. steel cable was next attached; it had a grommet and clips at one end to fasten it to one eyebolt on the hook, as shown, and had clips, a grommet and a hook at the other end to permit fastening it around an anchor stump. A 24-in. length of short-linked ⅜-in. chain, fitted with a split hook at the outer end, was attached to the other eyebolt. The radius of operation of the device could, of course, be made greater by providing a longer chain and cable. A 20-ft. chain of the same kind was also fitted with a stout split hook at one end. A light ¼-in. chain, about 4 ft. long, was attached to the handle end of the pole and a hook provided



Simple and Efficient One-Man Stump Puller

at the free end, which could be fastened to the steel cable or long chain when the worker came to the end of the stroke and had to reset the chains.

It is, of course, obvious that, while one man can use the device efficiently, a helper would permit him to accomplish more than twice as much during the same time. A study of the first and second positions shown in the illustration will explain the method of using the stump puller. With it, stumps are pulled with ease and speed, with no horses to consider or to manage; the gains are held securely, allowing changes of chains to be made and roots to be cut with the ax, and plenty of power can be exerted.

Telltale Light on Basement Circuit

After having come up from the basement without putting out the light a number of times, I resolved to put an end to the omission. I purchased an ordinary doorbell transformer designed to connect to 110-volt lighting lines, a roll of bell wire, and a small 6-volt auto-parking lamp. I connected the two rubber-covered wires from the transformer to the two terminals on the basement light socket, so that, when the light was on, the transformer was also on. Then I ran two lengths of bell wire from the two 6-volt terminals of the transformer up through the floor into the kitchen, where the basement light switch was located, and up the outside of the kitchen wall to the small lamp, which I had fastened on the wall about 4 ft. above the floor. Whenever the cellar light is on, the auto light is also lighted, and is a constant reminder not to forget the former. This telltale lamp uses less current than the smallest 110-volt lamp, and materials cost less than for a 110-volt installation. —Chas. W. Brown, Springfield, Mass.

Lifting Wagon Wheel

One of the rear wheels of a huckster's wagon came loose and the driver had to repair it single-handed. The simple method

Lifting Wheel of Loaded Wagon by Using a Prop

shown in the drawing enabled him to do this without much trouble. Instead of attempting to lift the wheel directly, he placed a prop under one spoke and pulled upward on the opposite spoke.

Japanese-Effect Book Ends

A pair of book ends to match the Japanese lamp which adorned my table were greatly desired and they were constructed from an old board as follows: The board was cut into four pieces, each piece ½ by 4 by 6 in. These pieces were nailed together along the 6-in. side. A number of tiny triangles, squares, crescents and circles were cut from brightly colored advertising pages. These were pasted irregularly over the wood, thoroughly covering it. The finished pieces were then shellacked.—Clyde E. Volkers, Terre Haute, Ind.

Bright-Colored Pieces of Paper Glued Irregularly on Wooden Book Ends

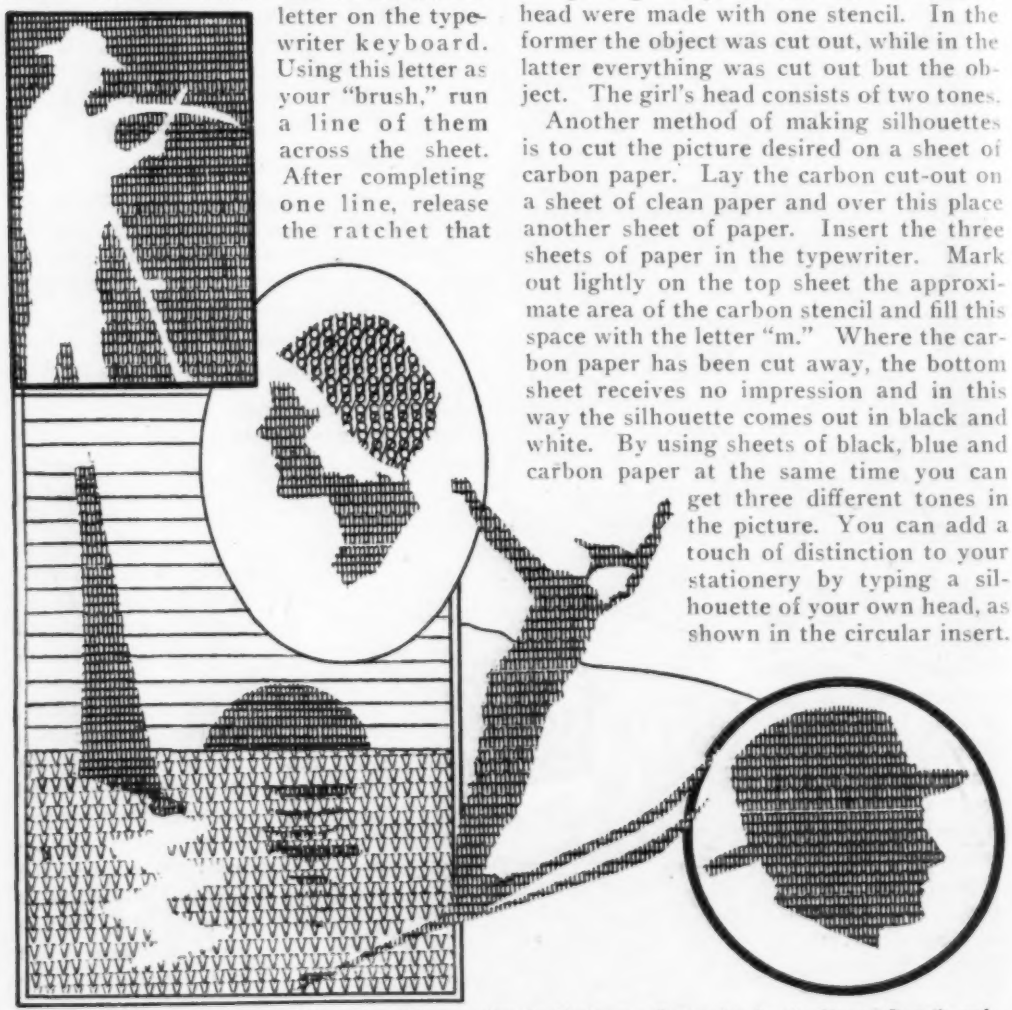
How to Make Typewritten Silhouettes

By ROBERT GREGG

SILHOUETTES on a typewriter? Certainly. All you need is a sharp penknife and some sheets of thin paper, and you can make something far more attractive than the ordinary typewritten page. Draw the outline of the picture you desire to make a silhouette of, on a sheet of thin paper and then cut it out, using a pair of scissors or a sharp penknife. With tiny dabs of paste fasten this picture on a sheet of clean paper. Insert the double sheet into the typewriter, the cut-out to the front. The small letter "m" is the blackest letter on the typewriter keyboard. Using this letter as your "brush," run a line of them across the sheet. After completing one line, release the ratchet that turns the platen of the typewriter, and move down so that the top of the next line will just fit under the first line. Type the second line and then finish the whole picture in this manner

In the illustration are shown some samples of the work. For silhouettes composed of only one tone, one cut-out is needed. But if you wish to make a picture of two or more tones, as many stencils as tones are needed to make the finished picture. The picture of the farmer sharpening a scythe and that of a man's head were made with one stencil. In the former the object was cut out, while in the latter everything was cut out but the object. The girl's head consists of two tones.

Another method of making silhouettes is to cut the picture desired on a sheet of carbon paper. Lay the carbon cut-out on a sheet of clean paper and over this place another sheet of paper. Insert the three sheets of paper in the typewriter. Mark out lightly on the top sheet the approximate area of the carbon stencil and fill this space with the letter "m." Where the carbon paper has been cut away, the bottom sheet receives no impression and in this way the silhouette comes out in black and white. By using sheets of black, blue and carbon paper at the same time you can get three different tones in the picture. You can add a touch of distinction to your stationery by typing a silhouette of your own head, as shown in the circular insert.



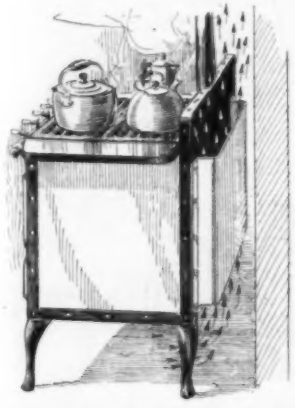
Novel Silhouettes and Two or Three-Tone Pictures Can Be Made on a Typewriter by the Use of Stencils and Different Letters for Various Degrees of Shading

Removing Vegetable Stains

To remove stains of vegetables or fruits of any kind from cloth or wood, the following method is very good: The stained piece is first moistened with water and then put in a jar or pail that can be covered. A lump of sulphur is ignited and dropped into the jar. Place the sulphur on a fire shovel when lighting it, to avoid burns. The burning sulphur should be placed in the receptacle on the side where the stain will be exposed to the fumes. The sulphur burns slowly so that the articles will not be harmed. After the sulphur has burned away, the jar should be kept closed for a few minutes and when the articles are removed the stains will be gone. This is harmless to try, and the cloth will not be injured if it is dry. However, the articles should be washed and dried immediately after they have been removed from the jar.

Protection for Wall behind Stove

When a gas stove is set up near a painted wall, the heat from the oven will soon blister the paint. The gas company may offer to tack a sheet of asbestos to the wall, but besides marring the paint, quite a difference in shade can be seen, when the asbestos is removed and the protected surface exposed. A better protection is shown in the drawing. A sheet of metal, as large as the back of the oven, is bent with a 1-in. flange on each side and riveted to the oven back. In this way, a sort of chimney is formed, which is closed at the sides and open at the top and bottom. The hot air between this plate and the oven flows upward, causing cold air to be drawn from beneath, and thus preventing radiation of heat against the wall.—Harold E. Benson, Denver, Colo.



Screened Shelf Outside of the Window Permits Proper Airing of Dairy Utensils

Screened Shelf for the Milk House

The idea represented in the drawing will appeal to the dairyman having a small milk house. It permits airing and drying of the utensils outside, but is within easy reach from the inside of the building. To make such a device, run strips of wood at an angle from the top corners of the window down to a point on the level with the bottom of the window opening. Provide a solid shelf below and cover the three sides with screen. When the window is down, no dust can enter the building, yet, by merely raising the sash, dishes that should be sunned can be placed outside.

Striping In White on Furniture

Many amateur painters who have tried to stripe furniture with flake white have difficulty in getting a mixture that will flow freely and dry rapidly without running. It has been found, however, that this can be done easily by mixing a few drops at a time of good rubbing varnish with the flake white. If it should still be a little thick, use a few drops of turpentine to thin the flake white before adding the varnish.—L. H. Georger, Buffalo, N. Y.

Cycling Clown Amuses the Youngsters

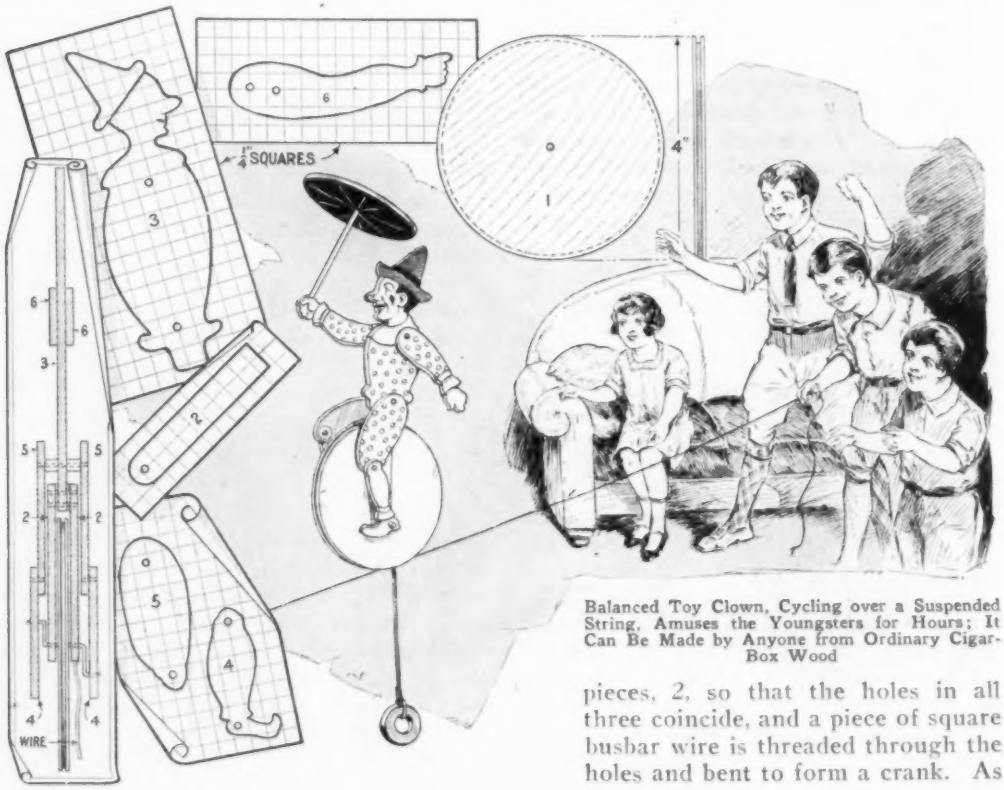
By HERBERT C. McKAY

A CLOWN who rides a monocycle along a taut string will amuse the children for hours and is very easily made. The material used is heavy cigar-box wood, and the only tools required are a scrollsaw and a few others that are found in almost every home.

The pieces are laid out as shown in the drawing, on paper ruled off in ¼-in. squares. The wheel is 4 in. in diameter. A short length of square wire, such as radio busbar, about 1 ft. of 18 or 20-gauge hard iron wire, and a 2-oz. weight are necessary besides the wooden parts. A groove is first cut around the edge of the wheel. If no lathe is available, this can be cut with a handsaw, making the cuts exactly the same depth all around the wheel. Then place the wheel against the saw and turn it, to cut down irregularities in the groove. After the other pieces are cut with the scrollsaw, they should be sandpapered smooth.

Painting is more easily done before the assembly than afterward. The quick-drying lacquers now on the market are best adapted for this kind of work, and the finish is smooth, glossy and brilliant. Naturally the colors chosen will depend on individual taste. In the original, these colors were used: wheel, bright green; clown suit, bright red with yellow polka dots; bands at the wrist, ankle and knee, bright yellow; hat, collar and saddle, lavender; face, white with features in crimson. The umbrella, which may be added if desired, was bright green.

The assembly should proceed in the following way: Attach the square ends of the two pieces, 2, to the bottom of the body, 3, with ½-in. wire nails, first placing a cardboard spacer on either side of 3; the arms, 6, are nailed to the body in the fixed position shown in the completed figure; the wheel is inserted between the side-



Balanced Toy Clown, Cycling over a Suspended String, Amuses the Youngsters for Hours; It Can Be Made by Anyone from Ordinary Cigar-Box Wood

pieces, 2, so that the holes in all three coincide, and a piece of square busbar wire is threaded through the holes and bent to form a crank. As

it is to serve also as an axle for the wheel, it should fit tightly in the hole in the latter, but loosely in the side-piece holes. A drop of glue at the points where the axle passes through the wheel will help hold the axle firmly. The upper parts of the legs come next. A piece of busbar wire is fixed firmly in the lower body hole (piece 5), a washer, cut from an old auto gasoline pipe, is fitted on either end, and the pieces 5 are placed on the outer ends of the wire so that they will move freely, the washers being of such thickness that the leg pieces will not bind against the pieces 2. The lower legs (4) are fitted loosely to parts 5 and to the crank ends as shown. There is only one thing to watch for; see that the radius of the crank arms is such that the legs never become fully extended, or they may lock, and the wheel refuse to turn. The wire on which the balancing weight is hung is driven into the lower end of one of the pieces 2, and a hook is formed on the lower end for the weight.

Stretch a string tightly in a horizontal position and place the groove of the wheel on the string. By carefully bending the wire you can readily find the best position for the weight so that it will hold the toy upright. If such a position cannot be found, the weight is too light and a heavier one should be substituted. When the balance has been found, lower one end of the string, place the toy at the upper end and it will roll down the string, the legs working in the proper fashion. An umbrella can be made from a disk of cardboard glued to the end of a short stick, which is in turn glued to one of the hands.

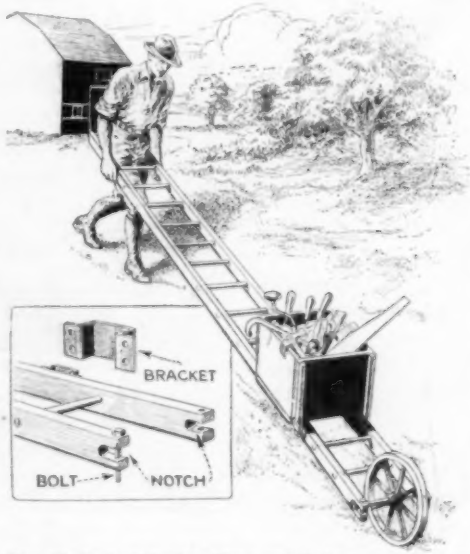
¶A cure for ivy poisoning that never fails is to wash the affected parts with a solution of sulphate of magnesia, commonly known as epsom salts, and then apply sulphur.

Carrying Ice on Running Board

To carry ice on the running board of a car, take the lid of a small spice can and screw it to the running board, upside down. The edges can be notched but do not necessarily have to be. The holder is not in the way at all and need never be removed. The ice is placed on it, and as it melts, the edges enter into it, so that the piece will not slip off easily.—Thos. F. Johnson, Cuero, Tex.

Combination Ladder and Wheelbarrow

For doing odd jobs about the farm, the workman is generally handicapped by the necessity of first wheeling the tools to the scene of operation and then bringing the ladder. By combining the ladder and wheelbarrow as shown in the illustration, much work and time can be saved. Drill a hole in the ends of the ladder sides and cut a slot to accommodate an old barrow wheel and axle. Then drill smaller holes through the sides, at right angles to the slot, to receive long bolts. Make two metal brackets and screw them to the ladder about 18 or 20 in. back of the wheel. Then fit two wooden stakes in these brackets to hold the box of tools.



One Method of Saving Time and Labor on the Farm

Painting Shingles Quickly

It is a tedious task to paint a large number of shingles by hand. A quick method of doing it is to dip them as shown in the

Quick and Handy Method of Painting or Staining Shingles without Waste

photo. A 5-gal. oilcan will be found useful for holding the paint, the top being cut off to permit the shingles to be inserted easily. A large piece of sheet iron, triangular in shape and having two sides bent up to form a ridge, makes a good drip pan. It is set at an angle and a pail is set directly under the lower corner. A wheelbarrow will be found convenient for holding both the dipping bucket and the drip pan. With this arrangement very little paint is wasted.—Mrs. V. S. Martin, Detroit, Mich.

How to Demagnetize a Watch

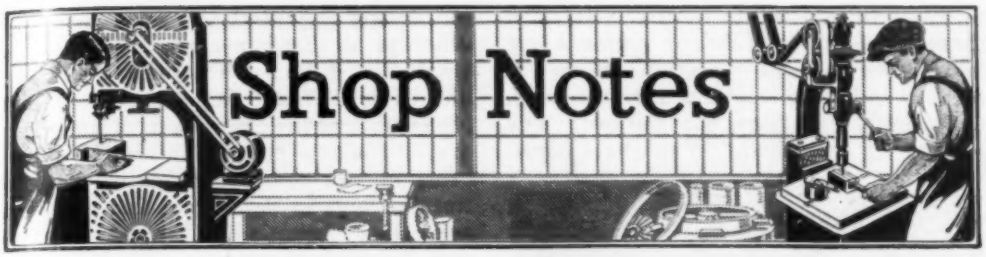
Quite often an attendant, or a visitor, at an electric power plant, discovers, after a few days, that his watch is losing a half hour or more a day. The reason for this probably is that the watch has been magnetized by the generators.

A jeweler demagnetizes a watch in the following way: He has a piece of soft iron with an opening cut in its center of such a shape and size as to receive the watch, and with a fine wire wound about it. After the watch has been placed in position, an alternating current is sent through the winding, and thus a magnetic field is produced that also changes in direction as the current reverses. The current is gradually reduced in value and the magnetism originally possessed by the watch is removed. When an alternating current is not available, a direct current may be used, its direction being rapidly reversed by what is known as a polarity changer.

Anyone can demagnetize his own watch, however, with very little trouble and no expense. Obtain a piece of heavy linen thread, about 3 ft. long, attach one end of it to the ring of the watch, hold the other end and turn the watch around until the thread is twisted at least 100 times. Now allow the thread to unwind and as the watch revolves move it back and forth near a strong electromagnet. The field magnet of a good-sized generator or motor will answer. The machine should be in operation, or at least there should be a current in the windings about the field, when you attempt to demagnetize the watch. While the thread is unwinding and the watch moved in the magnetic field, gradually withdraw from the magnet so that when the watch ceases to revolve it is just outside of the field. Always be sure to keep the watch revolving while it is in the magnetic field, otherwise the results will be very unsatisfactory, and more harm than good will result.

Floating Frame Holds Milk Can

When a partly filled milk can is placed in a cooling tank, it is common practice to weight it down with rocks or iron to prevent it from turning on its side and spilling the contents. As the removal and replacing of the weights makes access to the contents rather difficult, an Illinois dairy farmer devised a floating frame, consisting of 2 by 6-in. pine planks, in which the can stands upright at all times. The lid may be left loose or removed entirely to facilitate the cooling process. When the float is used in a large tank, a short length of chain should be used to hold it to the side of the tank.



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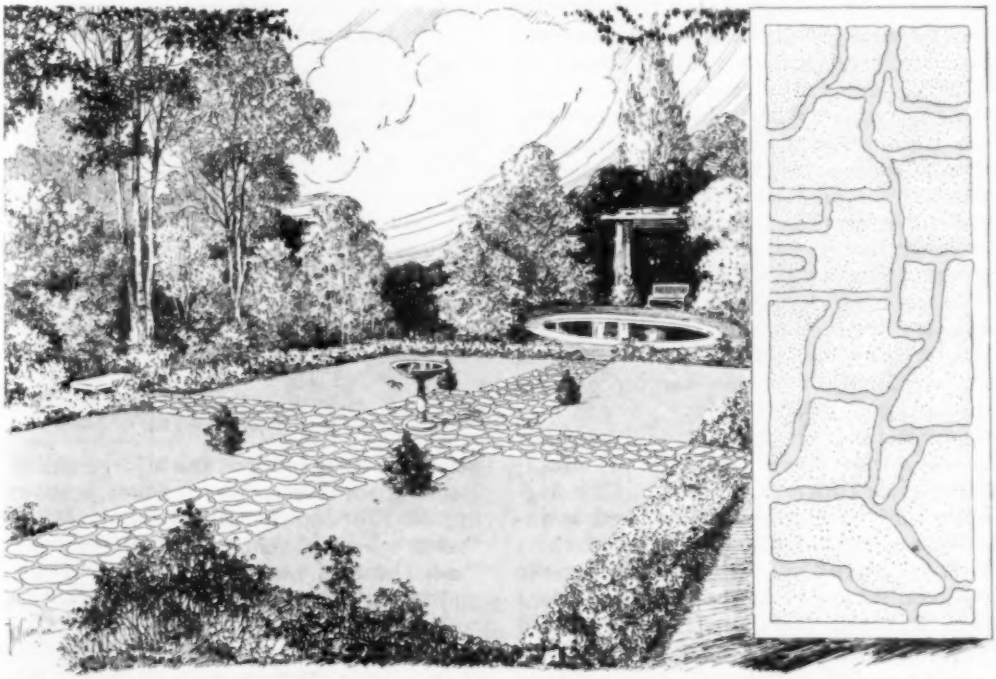
Make Your Own Flagstone Walk

By ALLAN R. SMITH

THE flagstone walk as a useful and beautiful addition to the home landscape has long been confined to sections of the country where suitably shaped rocks, stone or slate could be found. Lately, however, the adaptation of concrete to such walks has made it possible for anyone with a knack for tools to build one regardless of location. The cost is very small and the work so easy that it is almost play.

The first step is to lay out the design of the stones, according to the width and length of the walk to be flagged. Any pattern that strikes one's fancy and conforms to the shape of natural rock can be used. A suggested pattern is given in the drawing. It can be drawn on a small scale until the right shapes are found, and then the actual size of each piece may be cut from cardboard. Rather than make individual patterns for the full length of the walk, a good plan is to cut patterns for about 10 ft. of the walk, repeating the same patterns for the full length of the flagging.

A cord is stretched along each side of the intended walk, curving around flower beds



This Drawing of a Flagstone Walk Is from an Actual Photo of a Walk Done in Concrete, as Described in the Article; Right, Pattern for Flags

or trees to add to its beauty. Between these cords the cardboard patterns are laid on the sod and the outline of each is marked with a knife, the pattern removed, and a hole, 3 in. deep, scooped out. The bottom of each hole should be tamped

Entrance Walk Laid with "Natural" Concrete Flags, Closely Simulating the Real Thing

thoroughly to provide a solid base for the flagstones.

The best concrete for flagstones is a 1:3 mixture. By this is meant one part of portland cement to three parts of sand. The materials must be clean and measured accurately.

Three cubic feet of sand are spread on the mixing board, usually a level platform made of tongued-and-grooved boards. One sack (1 cu. ft.) of portland cement is spread over the sand and thoroughly mixed by turning over and over with shovels until the color of the mass is uniform. Adding the right amount of water is most important. Too much water in concrete weakens its final strength and is just as bad as leaving out some cement. Only sufficient water should be added to make a quaky jellylike mixture.

As soon as the concrete is thoroughly mixed, it is ready for the earth forms that have already been dug. After it is placed, a wood float is run over the top of each stone to make a level, gritty surface.

In hot weather, the walk will be ready to use within three days. In the meantime, better concrete will result if the flagstones are covered with earth and sprinkled once or twice a day to keep them from drying too fast. In cool weather, the walk should not be used for a week to ten days, and the same earth covering and sprinkling should be done.

If the maker of the walk does not care for the flat finish produced by the float, but desires to imitate the worn surface of old flags, all that is necessary is to select a single flat stone, with a surface as irregular as desired, and impress this stone on the surface of the concrete flags while they are still plastic enough to retain the impression. If cement colors are used to tint the flags in light blues and grays, an even closer imitation of the natural stone may be obtained.

Inlaying Brass Letters in Steel

Letters, names or numbers cut in a steel surface with acid or steel letter punches can readily be filled with brass. This is accomplished by heating the prepared steel red-hot in a brazing furnace, forge or kitchen range, and flowing spelter in the indentations. Use borax as a flux and a piece of brass wire for the spelter. The wire can be handled much easier than the regular brazing spelter. Be sure to braze a good thick coat of brass on the lettered surface. After cooling, the surplus brass is filed away from the top of the article and the steel surface is polished. The indentations will be filled with brass. Tools may be marked in this manner.

A Place for the Shop Needle

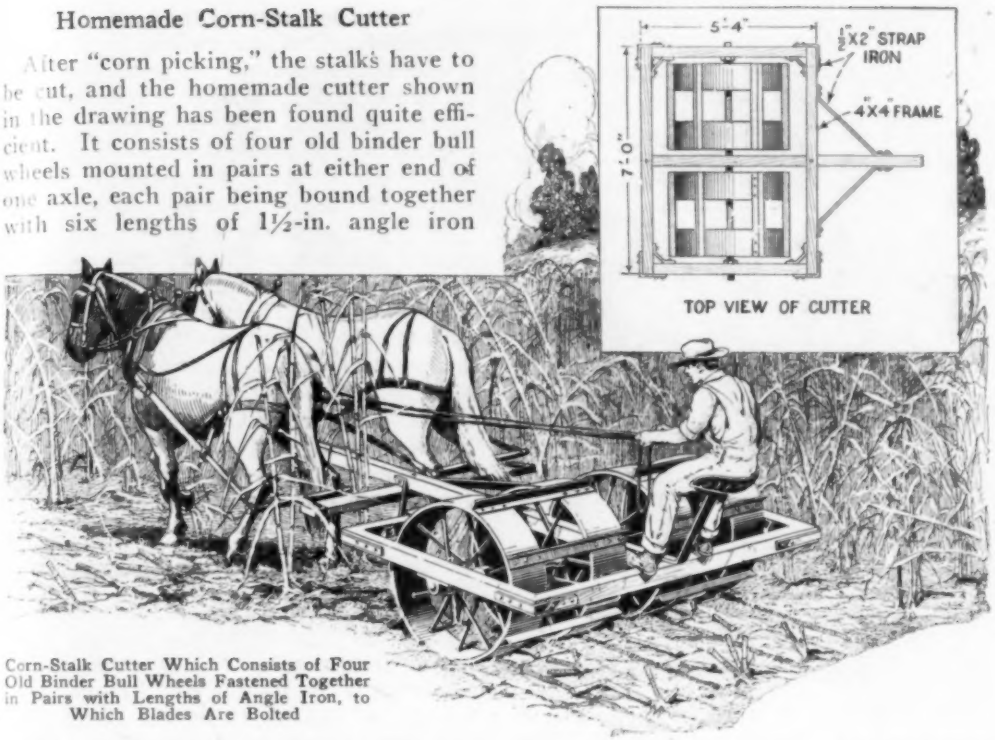
Most mechanics who keep a needle and thread in the tool box, for first aid to overalls and buttons, have a hard time keeping track of the needle. Take two used lead

A Leadless Pencil Pushed through Spool Provides a Safe Place for Needles

pencils, a little longer than a large needle. Remove both the eraser ferrules, smoothing off the slightly burred points on the inside, which clinched them to the wood. Push the lead out of one of the pencils and whittle the ends so that the ferrules will act as caps on the ends. Push the hollow pencil through the spool, and there is the whole thing together. You will not lose the needle any more.

Homemade Corn-Stalk Cutter

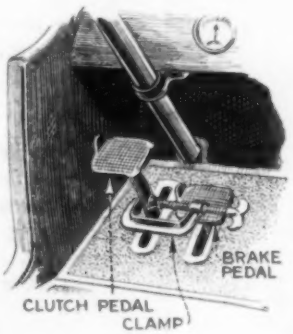
After "corn picking," the stalks have to be cut, and the homemade cutter shown in the drawing has been found quite efficient. It consists of four old binder bull wheels mounted in pairs at either end of one axle, each pair being bound together with six lengths of 1½-in. angle iron



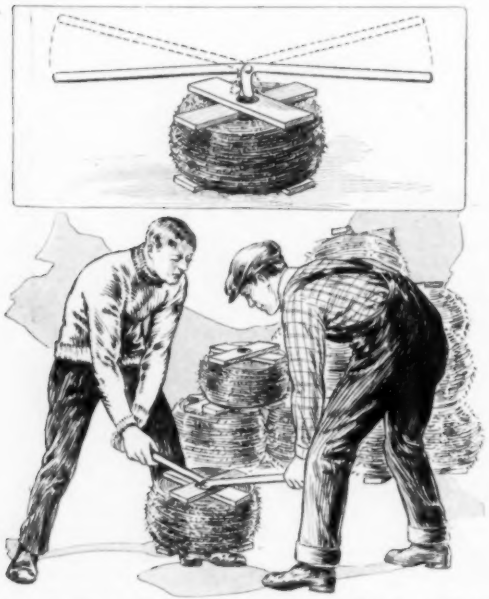
Corn-Stalk Cutter Which Consists of Four Old Binder Bull Wheels Fastened Together in Pairs with Lengths of Angle Iron, to Which Blades Are Bolted

which are riveted to the wheels as shown. The protecting side of the angle iron is drilled and steel blades, 4 in. wide and ½ in. thick, are bolted on. Ordinary angle iron will serve the purpose if the field is free from rocks. If not, it is advisable to use steel blades. The frame is 7 ft. long and 5 ft. 4 in. wide and is made of 4 by 4-in. stock. All the iron braces used are made of flat stock, ½ in. thick and 2 in. wide. The ends of the axle are supported under the frame by means of ordinary bearings, bolted in place with lag screws. Each wheel is also anchored by means of the flange and setscrew, with which each was originally provided. The tongue is securely mortised or bolted to the frame, as indicated, and is further strengthened with flat-iron braces. The centers of the two pairs of wheels must be 3 ft. 6 in. apart, so that the cutter will take two rows of corn. If desired, the front end can be weighted down and a seat from an old mowing machine can be mounted on the back. To do this, the seat should be attached first and, with the driver seated on it, the weights in front should be put on so that there will be a slight steady weight on the neck yokes of the team. The doubletree is attached to the underside of the tongue.—Dale R. Van Horn, Lincoln, Nebr.

Clamp Holds Pedal Depressed



The drawing shows a good method of holding the brake or clutch lever of an automobile immovable while adjusting, renewing parts, cleaning the clutch faces or other repairs. Screw a large C-clamp to the clutch pedal so that the clamp screw will press against the brake pedal as indicated. The work can then proceed without danger of the pedal slipping. If the clutch pedal is to be held in, the clamp, of course, is screwed to the brake-pedal shank.—G. A. Luers, Washington, D. C.



Handy Tongs Used to Carry Heavy Spools of Barb Wire Safely

Tongs for Handling Spools of Barbed Wire

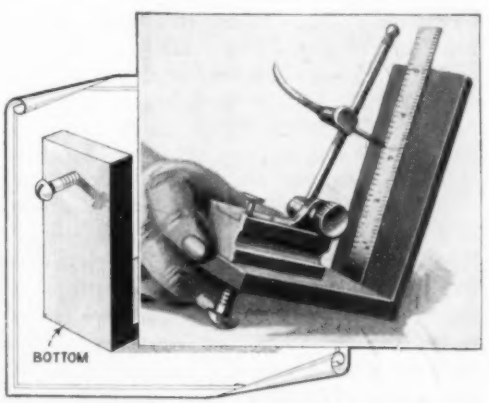
Handling barbed wire often results in serious injury to hands and clothing. One dealer employs a simple pair of tongs with which the spools can be handled rapidly and safely by two men. They are constructed and used as shown in the illustration. When the "beak" ends are inserted in the opening in the center of the spool of wire and the handles raised, the ends grip the spool so that it can be carried about easily and without any danger.

Replacing Ford Crank Spring

The spring on a Ford starting crank must be replaced now and then. This is usually because the inner end has worn thin, and jams between the crank and its bushing when trying to use the crank. The trouble also occurs on starter-equipped cars, as the crank swings while the car is being driven and wears the spring. Since the crank is used only when the battery is run down or the motor is cold and stiff, a jamming crank is very troublesome. On the later-model cars, the spring can easily be replaced without removing the crank or ratchet. Such cranks are a one-piece, round iron rod with a sleeve, free to turn, pressed over the outer end. The old spring is removed by grasping the outer end with a pair of pliers and pulling until it unwinds and comes off. A good grip must be kept on it or it will fly out and may injure someone. The new spring is compressed by the fingers and twisted slightly to unwind it, which will increase the size of the opening through it. It is slipped over the crank sleeve when held in this expanded condition and worked over the crank into place against the front end of the crankcase. The bent-over end of the spring, which fits into the small hole drilled in the crank, is sometimes bent out so that it will not stay in the hole. In this case, the end of the spring wire should be held slightly out of the crank, about 1 in. from the bent-down end, and bent down again with a pair of pliers.

Handy Method of Setting Surface Gauge

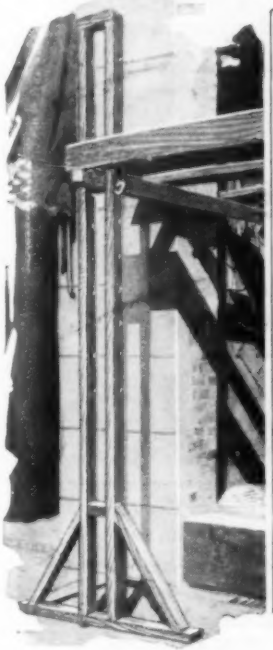
Many mechanics have a habit of holding a scale flat against an angle plate when setting the needle of a surface gauge. However, if the scale is held by one hand, it is rather difficult to set the gauge with the other, and if the scale is not so held, it will fall down at the slightest touch. I solved this difficulty by drilling and tapping a hole in the bottom of the angle plate and putting in a screw, as shown.



Practical Method of Setting the Mechanics' Surface Gauge Also Makes Reading Easier

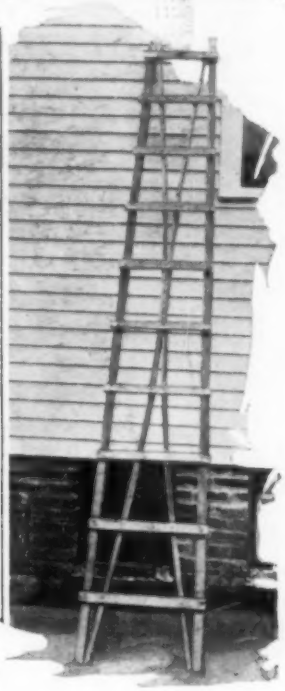
I lay the scale up against the back where it does not have to be held at all. A further advantage I found upon use, was that the scale marking was much easier to read than when it was held in a vertical position.—Harry Moore, Montreal, Can.

Hints for the Builder

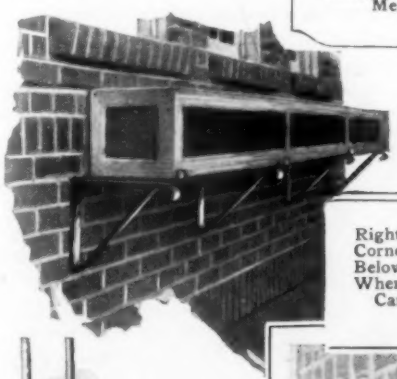


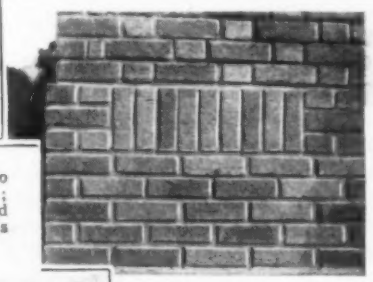
Simple Adjustable Scaffold for Store-Front Erection

A Painters' "Cripple" That Makes the Painting of Trim Easier; a Couple of Lengths of Pipe Pass through the Members Projecting Inside



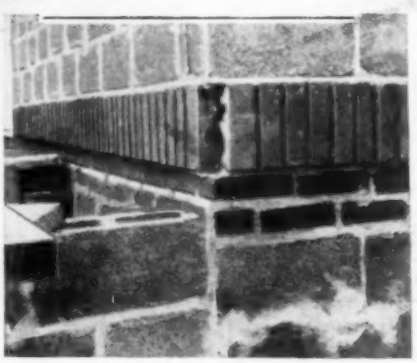
A Well-Braced Light Ladder for Interior Work

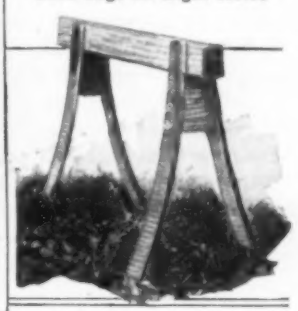




Right, the Correct Way to Corner a "Soldier" Course; Below, Difficulty Encountered When a "Soldier" Course Is Carried On to the Corner

Above, Built-In Box Brackets; Left, Home-made Tamper

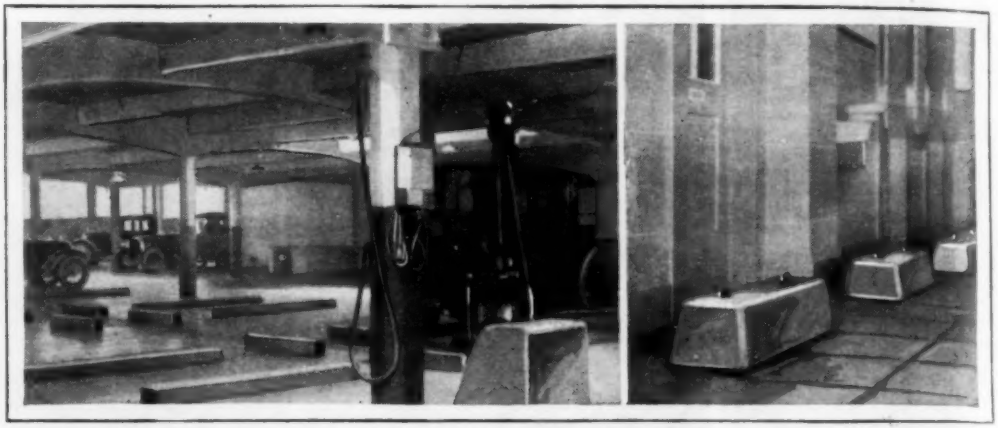




Below, Barrel Staves Make Good Legs for Light Horse

Concrete Garage Bumpers

The accompanying photo shows how one garage man solved the problem of providing bumpers in his garage. He makes them of concrete and they are heavy enough to stand considerable abuse, although they are readily portable. Ropes or chains are fastened to the eyelets so that the bumpers may easily be moved from place to place.—A. S. Bowes, Chicago, Ill.



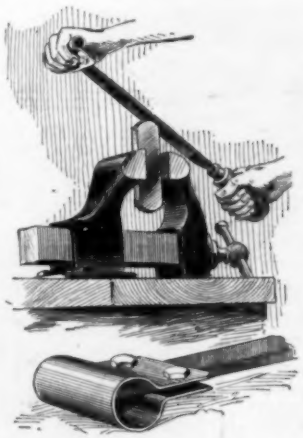
Concrete Bumpers in a Large Garage Are Heavy Enough to Withstand Abuse and Can Readily Be Moved from Place to Place

Killing Tent Caterpillars

Cutting or burning the web of tent caterpillars, which form in trees in many sections of the country, is rather difficult. A much better method of killing these pests is to use auto crankcase oil and kerosene, or the latter alone, in the following way: A 1-pt. plunger oilcan is obtained and a 3-ft. length of hard-copper tubing, such as is used for auto-feed systems, is securely soldered to part of a threaded coupling, while the other part is soldered to the spout of the can. The end of the tubing is bent to form a hook. The hook is inserted in the web and a stroke or two of the plunger saturates it. No more than a teaspoonful is required for a small web (and more for a larger one) to completely destroy the pests in a few minutes. This method is quick and easy, and the oil injures the tree much less than cutting or burning the webs. It is also more pleasant to apply the oil than to remove the webs by hand in cases where cutting and burning cannot be resorted to, as in the crotches of large branches. The only change made on the oilcan, besides attaching the tubing, is to reinforce the lower cup bearing in the plunger with a ½-in. iron washer, to take care of the increased "head" of oil.—W. H. Pennypacker, Ashland, N. J.

Extra Handle Aids Filing

A blacksmith contracted to turn out a large number of duplicate pieces of work, all of which needed filing. After using a file in the regular manner for some time, the constant pressure of the point of the file on the palm of the left hand was more or less tiresome and painful. He therefore fashioned a point handle, as shown in the drawing, and this made the job much easier. A piece of flat steel, about 2 in. wide, was doubled and bent to the shape indicated. Two holes were drilled through the sides of the handle near the corners and tapped for bolts. The



handle was slipped over the point of the file and the bolts tightened until the file was gripped firmly.

Cooling System for Crude-Oil Engine

In order to keep the water used in the cylinder jackets of a large oil engine at a moderate temperature, the structure seen in the photo was erected and found to be both effective and cheap. A water pump is installed in a circuit of 1-in. piping that connects with a concrete pool on the ground, under the frame, and with the barrel mounted on its top. As the engine runs, the pump forces the water into the barrel until it is filled, when it overflows through notches in the ends of the staves and trickles down the sides all around the barrel. Underneath the barrel, several decks or floors are made of narrow slats, spaced about ¼ in. apart. Although not so shown in the photo, the floor of each deck is preferably laid at right angles to the one above. The water drips through the several floors, and this cools it thoroughly. The return pipe to the pump and engine is connected to the concrete pool, which is larger than the frame of the "radiator," to prevent waste of water.

Cheap and Effective Device for Keeping a Crude-Oil Engine Cool

Convenient Homemade Apparatus for Hoisting Baled Hay into Barn Loft

Hay Hoist Saves Work

The baled-hay hoist shown in the photo has saved much time and hard labor on the farm of John Dickens, near Floral, Kans. The chain in the middle of the slide carries the bales up. Chain links with extensions, taken from a discarded corn binder, were placed in the hoisting chain at 6-ft. intervals. The links bear against the ends of the bales and move them up the slide. The chain, which is countersunk in the surface of the slide, is driven from the top by another chain as shown at the side of the slide, a 1½-hp. engine furnishing the operating power and raising the hay as fast as one man can lay it on. The base of the hoist is of a convenient height for unloading bales. When the hay is to be taken out of the barn, the hoisting chain is removed and the bales slide down by gravity.—Stanley Russell, Winfield, Kans.

¶When it is necessary to cut a slot in a piece of steel and the hacksaw cut is not wide enough to admit even a file, a wider slot can readily be made by using two blades and putting them side by side in the hacksaw frame.

Portable Forge Moved Around like Wheelbarrow Has Bracket for Holding Rivets

Portable Forge Carries Rivets

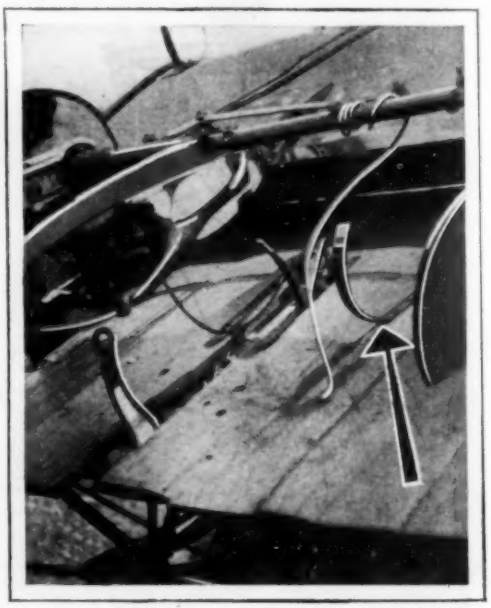
The rivet forge shown in the photo is equipped with a wheel and handle like a wheelbarrow, making it very handy and permitting it to be readily pushed from place to place. When stood on end, two legs hold it up, ready for use. However, the operator sometimes discovered, after a move, that there were no rivets along with which to do the job, so he devised the rivet holder shown. It consists of a steel bracket, ½ in. thick and 3½ in. wide, with holes drilled through it to accommodate seven rivets. The bar is welded to the front legs of the forge.

Producing Marble Effects with Paints

Prepare the colors to be shown in the marble, using varnish for the vehicle, and japan colors, reduced in turpentine, for making glaze colors or varnish stains. Put in the ground color with lead and turpentine and allow it to dry, then apply different glaze colors so as to give a mottled, variegated effect. No care need be taken in this part of the work, as the crudest efforts give the best results. Dissolve a lump of potash, the size of a pea, in 1 oz. of kerosene, and while the glaze coat is fresh, dash small drops of this on the painted surface. This will separate the colors and blend them into very pretty marble effects. By the exercise of a little taste and ingenuity, surprising effects can be obtained. If spar varnish is used, it can be rubbed down and a coat of clear spar put on as a protector. I have in my yard a pair of large garden urns made of plaster of paris, marbled to a malachite green, and these have stood the weather for four years.—Wm. G. Browning, Los Angeles, Calif.

Binding Short Grain Evenly

When the heads of wheat or barley are unusually heavy or the straw is short, the heads fall forward faster than the butts and a loose, misshapen bundle results. To prevent this, bolt a piece of clock spring, about 1 ft. long, to the binder table, as shown, just even with the twine as it is drawn taut before the straw is forced into it. The spring holds the heads back even with the butts until the packers gradually force it down with the twine. Much grain is saved in this way and a compact bundle that can be easily shocked is formed. The spring shown has been in use three seasons and the steel is worn down thin as a razor.



Length of Clock Spring Bolted to Binder Table Helps Bind Short or Heavy Grain Evenly

Attractive Ship Plaque Easy to Make

by J. Tate

THE ship plaque described in this article is not only easy to make, but it forms a most unusual and handsome wall decoration. Its uses are not confined to this, however; as suggested in one of the drawings, it will make an attractive fire screen, or, with the addition of suitable brackets, a holder for the fire tools, such as tongs, poker and brush. Omitting the shield, the brass ship may be fastened directly to the front of a wire fire screen, where it will present a fine appearance, especially during the winter, standing out boldly against the firelight behind it.

The only materials necessary are a piece of 1/16-in. sheet brass, 12 by 15 in. in size; a piece of 1-in. veneer paneling, 17 by 25 in., to make the shield, or any other suitable lumber; about ½ oz. of nitric acid and a cake of paraffin wax. The tools necessary are a coping saw or a bracket saw, with about a dozen fine metal-cutting blades, a set of diemakers' files, a supply of fine emery and crocus cloth, a bottle of lacquer and a good badger brush, 1 in. wide.

The first step is to enlarge the pattern for the ship, given on page 343. The squares in the drawing represent 1 in., so the first thing to do is to lay the paper for the pattern out in 1-in. squares. The pattern should be made on stout brown wrapping paper, about 14 by 17 in. in size, and the squares on the top and one side should be numbered serially to facilitate transferring the layout points. Number the squares on the original to correspond. Now, with the brown paper tacked down flat, transfer the various points on the original design to the pattern, and draw in the enlarged design. This looks harder than it actually is, as, once the starting points are established, the remainder of the design is easily put in. As noted elsewhere, a blueprint is obtainable, which will eliminate the task of enlarging the pattern.

It is not necessary to cut out the design on the pattern. Trim the brown paper to the size of the brass sheet, and paste it down on the latter. Rubber cement will be found best for this purpose, although shellac or liquid glue will serve fairly well in its absence.

Now drill holes right through the pattern and brass wherever an opening appears in the design, so that the end of the saw blade can be passed through. The

Above, Use of Bracket or Fret-saw in Cutting Out Ship; Below, Coping Saw Used for the Same Purpose

The actual sawing out of the design is simple, demanding nothing but care and patience, but there are one or two little points that will aid the amateur if he observes them from the start. If you have had any previous experience with the fret or bracket saw, you will find it as good a tool as any; if not, the coping saw will probably be found easier to handle, although more inconvenient in threading and straining the blades. If a coping saw is used, it must be one in which the blade can be turned to any angle desired; the ten-cent store, wire-frame variety will not do. The blades should be inserted with the teeth pointing downward, so as to cut on the down stroke of the saw.

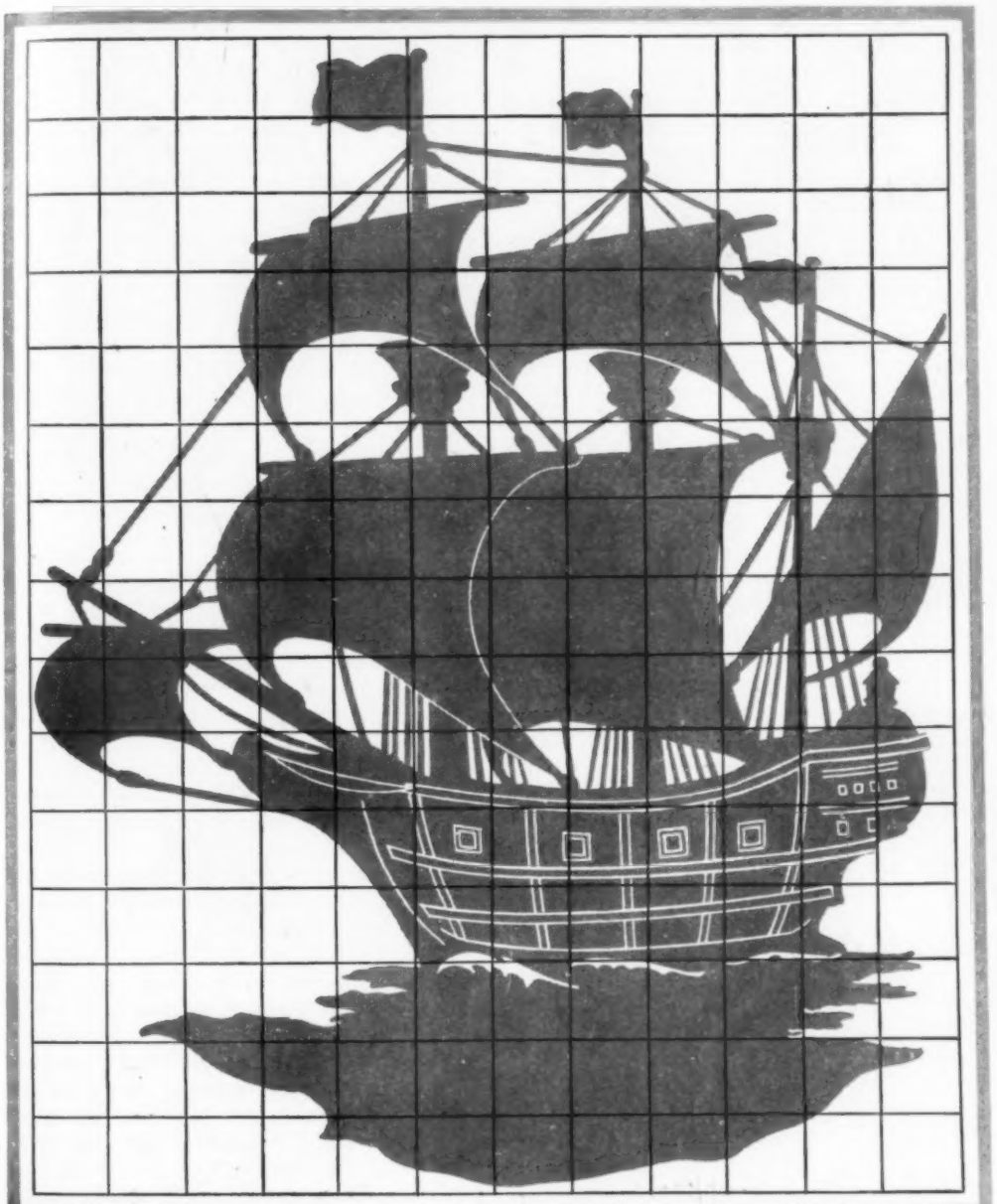
metal-cutting saw blades used have a doubled-over end, as shown on this page, and, in the larger openings, a hole sufficiently large to admit this end can be drilled quite easily. For the smaller slots, such as the spaces between the shrouds, it is necessary to cut the upper part of the doubled-over end of the blade off, and then to drill a hole in the wider end of the opening in the design, just large enough to admit the blade as shown in the same drawing. The saw can easily be "wangled" through in this manner, and, while the cutting of the upper end weakens the hook of the blade, it will be found to serve all right for the relatively few small openings to be cut, provided too much tension is not put on the blade in the frame.

Next, take a piece of board, 10 or 12 in. wide, about 1 in. thick and 16 or 18 in. long, and cut a wide "V" out of one end (see above). This is clamped in the vise or to the bench, and the sawing is done on it. The parts of the board on each side of the "V" support the work while it is being sawed and make the sawing easier.

When sawing into a corner, make the cuts as shown above. The first cut runs into the corner from the hole, cutting out one side of the design; then the blade is drawn back to the hole again, and a second cut made to complete the cutting out of the corner. A few minutes' sawing, however, will teach you more about the best way to do this than a volume of instruction. The main thing is to go slowly and carefully. If the outline of the ship is cut out first, it will help in cutting out the interior parts, especially if the coping saw is used, since it will enable the frame of

the saw to go closer to the work. Cut just on the outside of the lines of the design and leave a trifle for finishing with the file.

After the sawing is completed, clamp the ship between two pieces of board in the vise and clean up all over with the die-sinkers' files. When a line has been filed straight, drawfile it, that is, just draw the file back and forth along the edge, at right angles to the usual direction of filing. This is not essential, but it adds to the finished appearance of the work, especially on the outside edges. It will be found easier to keep the lines straight or the curves of the design uniform and true, if the filing is



Each Side of the Square in the Diagram Above Represents One Inch, and the Enlarged Pattern Can Be Made by Measurement from This

done from the back, that is, the side opposite that on which the pattern is stuck, since the sawing roughs up the pattern to some extent. In fact, the writer pulled off the pattern and scraped off the cement as soon as the sawing was finished, and filed "by eye" only.

The next job to be done, when all the edges have been filed true and clean, is to remove the pattern and cement, if that has not been done before filing, and then to select the side that is to be the face of the finished ship. Choose the side on which there are no deep scratches that will show up when the work is finished. Clean this side by polishing it with No. 00 emery cloth, polishing only in one direction, and preferably straight up and down in the direction of the masts of the ship. Now heat the ship gently over a gas stove or electric plate, and, when hot enough to melt the paraffin wax, coat the sheet by rubbing the cake of wax over the surface. Coat the whole ship evenly and completely, and set aside for the wax to harden. Mix one part of the nitric acid with two parts of water to make the etching solution (adding the acid to the water, not the water to the acid), then scratch in the lines of the side strakes, ports, etc., shown in white on the layout diagram, through the hardened wax on the ship. Use a fairly blunt steel point for this, and be sure that the lines are cut clean through the wax down to the brass. Do not try to scratch in these lines freehand, but use a French curve as shown on page 345, so that the curves will be fair and sweeping.

Then apply the etching solution to the lines, using a medicine dropper for the purpose, and, when the lines have been etched deeply enough, which will take but a few minutes, wash the acid off with water. It is best, when using this method of etching, to work on one line at a time, so that the etching can be controlled more easily. This is not the best method of etching, but it is the quickest and simplest, and demands little equipment.

When all the lines have been etched deeply enough, wash off the paraffin with benzine, and look over the lines. Any that are not etched in deeply enough may be cut deeper by the use of a tool made from an old hacksaw blade (see page 342). This is ground as shown, so as to cut on the draw, and is used with the French curve, just as in scratching the lines through the wax. If you are sufficiently sure of your command over the tool, you can dispense with the etching entirely and cut the lines in with the tool directly, first penciling in the lines lightly, and using the curve. Don't forget the line defining the after edge of the foresail, and those showing where the topsails come in front of the masts and tops.

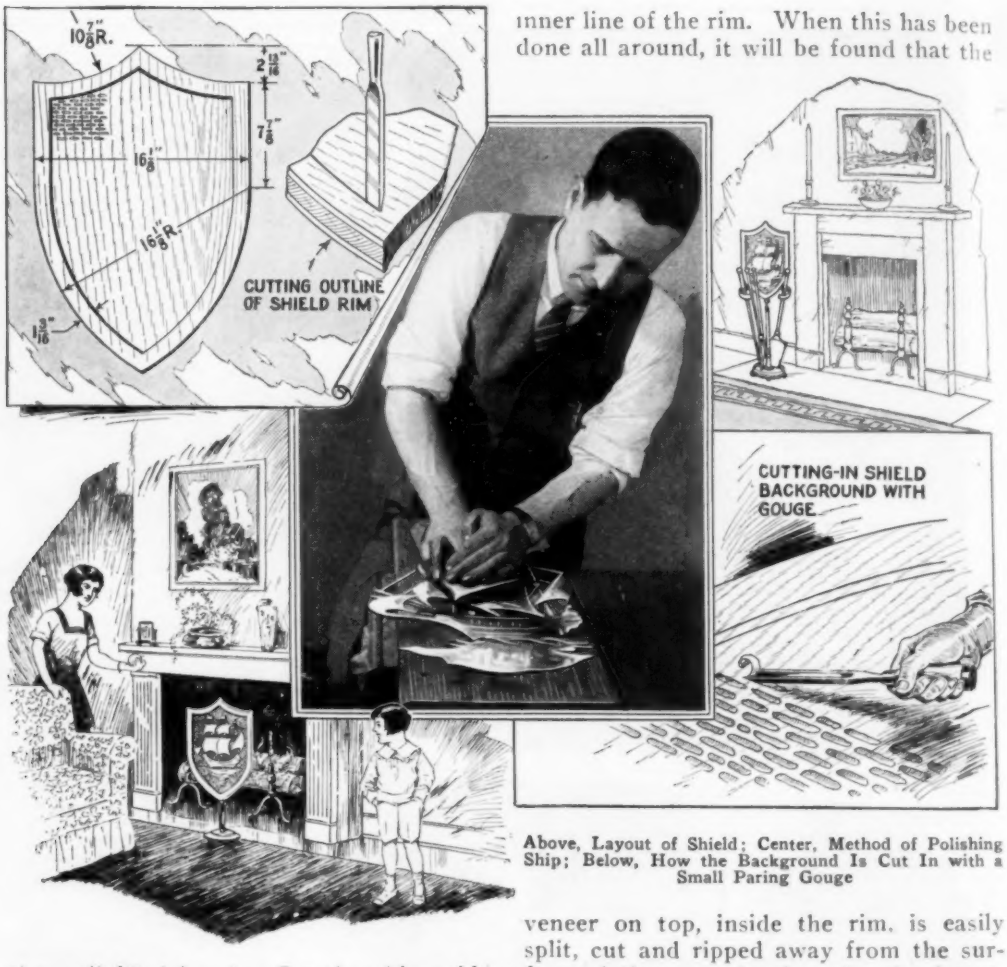
The ship is mounted on the plaque by means of two No. 8-32 flat-head brass screws, 1 in. long, the heads being soldered fast to the back, one about the center of the hull, and the other above it near the top of the mainsail. Solder these on now, and make a good job of it. Drill two holes in the cutting board to suit the screws, and countersink them for the heads, drop the ship, with the screws through the holes, on the cutting board, and you are ready for the polishing.

Fold a piece of No. 000 emery cloth over a piece of ½-in. felt, cork or even a piece of ½-in. wood, and start polishing as on page 346. Polish always in one direction, in the direction of the masts, and follow the No. 000 emery with a piece of the finest crocus cloth you can obtain. Get as good a polish as you can with the crocus, then finish with a good brass polish. Clean away every particle of dust from around the work with a soft brush, paying particular attention to the interior corners, then fill in the etched or cut lines with India ink, using a fine pen. Do not let the fingers touch the surface while doing this; keep a piece of clean blotting paper under the hands. The ship is now ready for lacquering.

The lacquer used should be one intended for metal; do not use a furniture lacquer. Use a soft badger brush, fill it full of the lacquer, but not too full, then, starting at one side of the ship, draw the filled brush straight down from top to bottom, coating a strip of the ship. As quickly as you can, coat a second strip alongside the first in the same manner, and coat the whole surface in this way. You must work fast, and the edge of the first strip must still be wet when the second is coated. Also, each brush stroke must cover a strip completely, for you cannot go back over it; hence the importance of

Left, Ship Clamped between Two Boards in Vise for Filing; the Edges of the Boards Come Up Close to the Edge to Be Filed, to Support It. File from the Side Opposite the Pattern, or Remove the Pattern before Filing. Above, after Filing, the Ship Is Heated on a Hot Plate and Coated with Paraffin Wax by Rubbing a Cake over the Surface; the Whole Surface Should Be Covered to an Even Thickness with the Wax, but as Thin as Possible

Above, Applying the Diluted Nitric Acid to the Lines Engraved through the Wax, Using a Medicine Dropper; Keep the Acid off Hands and Clothes. Right, Cutting the Lines through the Wax Coating, Using a French Curve to Get the Lines Bold and True



Above, Layout of Shield; Center, Method of Polishing Ship; Below, How the Background Is Cut In with a Small Paring Gouge

the well-filled brush. Set the ship aside to dry while you make the shield. If the first job of lacquering is poor, wash it off at once with turpentine, repolish and lacquer again.

The writer happened to have on hand a piece of five-ply veneer of the proper size for the shield, and therefore this was the material used. It may be made in any way desired, however, and perhaps the best material would be oak, with the background carved out and the whole finished in dark Flemish. Or the rim may be made of a piece of ⅛-in. veneer, cut out and glued in place on a flat back.

To make it in veneer, lay out the shape as indicated, using a piece of string, a tack and a pencil for the curves; then take a narrow chisel and cut down through the top two layers of the veneer along the inner line of the rim. When this has been done all around, it will be found that the veneer on top, inside the rim, is easily split, cut and ripped away from the surface of the core, leaving the rim intact. Should the core, as it usually is, be knotty and full of holes or other imperfections, fill these up with plastic wood, or a good crack filler, and, when hard, pare and sand the surface down smooth. It will probably look pretty spotty after this operation, but pay no attention to this. Now take a ¼-in. gouge and go all over the background, as indicated in the drawing and in the photo of the finished plaque. Make the cuts all about the same depth, but varying in length. When the whole background has been treated, give it three coats of ivory black in japan (not in oil), also known as carriage color, allowing it to dry between coats. You don't want a shiny black behind the brass, but if the last coat of japan black is rubbed gently with a soft cloth, it will acquire a slight sheen and the

black will be deepened. Stain the rim to suit your taste. It looks best in dark oak, dark walnut or dark-brown mahogany, just a shade lighter than the background. Lighten up the stain for the edges, or they will be too dark, as they absorb the stain more. Give the rim a coat of shellac after the stain has had 24 hours to dry. When the shellac is dry, rub down with the very finest steel wool, taking care not to rub through the shellac; then give a coat of fine cabinet varnish. When this has dried at least 24 hours—or better 48—rub it down to an even, soft gloss with rottenstone and oil. If oak is used for the shield, it would be best to finish it with wax.

After the shield has been completed, lay the ship in the proper position on top of it, and press the screw ends into the wood to mark the position of the holes; drill these, countersink on top for the screwheads and counterbore on the back for nuts and washers. After tightening the nuts, cut off the projecting screw ends flush with the back of the shield. Put in a couple of fine screweyes on the back, almost at the top, for the cord to hang it with, and the job is done.

There are just two hints on hanging the plaque. Let it hang flat against the wall, not tilted forward at the top. If possible, hang it on the same wall as the window that lights the room. If hung facing a window, or with the light coming from one side, in certain positions the ship "glares." When hung on the same wall as the window, the "back light" deepens the black on the shield, and the ship looks splendid from any angle.

To simplify the task of laying out the ship design, we have prepared a full-size blueprint, which can be cemented direct to the brass sheet. Send 25 cents for this to Shop Notes dept., Popular Mechanics magazine, 200 E. Ontario st., Chicago, specifying ship-plaque blueprint.

Concrete Mixture

A rich mixture of concrete consists of 1 part cement, 1½ parts sand and 3 parts gravel or crushed stone. This mixture should be used for structural parts where water is to be kept from columns and other parts subjected to high strain. A standard mixture consists of 1 part cement, 2 parts sand and 4 parts gravel. This should be used for reinforced foundations, for machines or engines, subject to vibration; for reinforced beams, columns, arches, floors, and for watertight work, such as tanks, conduit sewers, etc. A medium mixture consists of 1 part cement, 2½ parts sand and 5 parts gravel. This mixture is used for ordinary floors, and machine foundations, piers, thin foundation walls, abutments, retaining walls, sidewalks and heavy-wall sewers. A lean mixture consists of 1 part cement, 3 parts sand and 6 parts gravel. This mixture should be used only for heavy walls, backing for stone masonry and for large foundations.

Keeping Building Paper on Sawhorse

When building paper is being used on a house-construction job, it is often difficult to find a place where it may be unrolled conveniently. One contractor found a sawhorse handy for this purpose. Two notched crosspieces were nailed onto the legs of the sawhorse, as shown in the illustration, and upon these the roll of paper was supported by means of a length of broom handle. The paper can thus be unrolled as needed, and the roll is at all times protected from damage.—G. A. Hendrickson, Argyle, Wis.

Sawhorse Holds Building Paper So It Unrolls Conveniently

Wide Rubber Band on Base of Torch Prevents It from Slipping

Non-Slip Base for Blowtorch

When soldering eave-trough joints or roof valleys, it is often difficult to place a blowtorch in such a position that it will not slip yet be convenient. A Wisconsin tinsmith cut a wide rubber band from a discarded inner tube, and snapped it around the flanged bottom of the blowtorch, as shown in the drawing. The torch could then be placed on a steep roof without any tendency to slip.

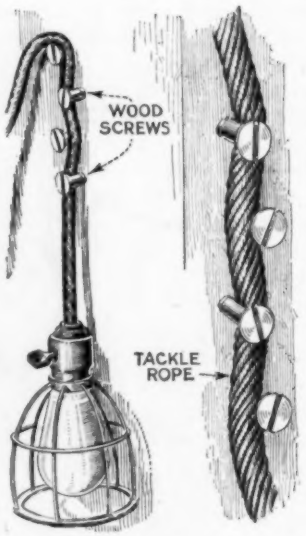
Improving the Small Forge

The average small-shop forge stands on three legs, has an 8-in. blower and a pan, 18 to 22 in. wide and about 3 in. deep. The blower is usually rated at 1 to 48 and has a sufficient blast for iron bars up to 1½ in. in thickness. However, the chief drawback is the shallowness of the fire, as by claying the pan to about half its depth, and using the remainder for fuel, the fire is seldom over 2 to 2½ in. thick, which is insufficient for heavy work.

With this in mind and noticing the lack of steady heat in my forge, I improved it as follows: I obtained a strip of heavy galvanized tin, about 6 in. wide, from a piece of culvert and cut it to the right length to fit around the pan and connect with the hood on both sides. This piece was securely and snugly fitted on the outside of the original pan with stove bolts, and similarly attached to the sides of the hood, to make the pan about 6 in. deep. It was then clayed to a depth of nearly 4 in., leaving a tapering hollow in the center, about 7 in. wide at the top and equal to the width of the tuyere at the bottom. The difference in the heat of the fire was surprising. To allow longer pieces of iron to be placed deeply into the fire, a hole, 3 in. wide and 2 in. deep, was cut in both sides of the pan, in a horizontal line across the center of the tuyere. To prevent wastage of coal through these holes, when not in use, they were closed by bending a light piece of tin, 6 by 4 in. in dimensions, to a U-shape so that it could be clipped over the side and pushed down on either side of the opening.

A good way to determine the right depth of a forge fire is to place a small piece of iron into the center of a good fire without a blast. The fire alone will keep the iron bright red. Now turn on a steady, slow blast; if the iron turns dark as soon as the blast is on, it is a certain indication that the fire bed is too shallow. The iron should be so deep in the fire that the air above will not cool it.—Joel E. Shoeberg, Rosewood, Minn.

Staggered Screws Hold Cable



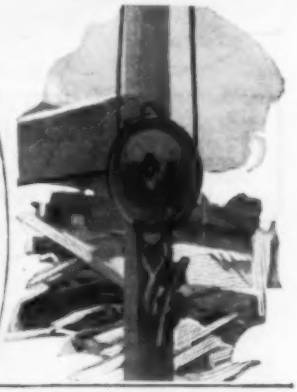
For the purpose of holding the loose ends of pulley ropes, hoisting cables or electric-light cords against the walls of buildings, the method shown in the drawing will be found convenient. Four screws are driven into the wall slightly staggered, so that the rope or cable will be held securely when placed between the screw heads and wall as shown, and the cable will not be injured.

Safety Hints for the Builder

This Scaffolding Is in a Bad Way; a Slight Jar Will Dislodge the Blocking, and Down Comes the Scaffold

See How This Plank Sags under Its Own Weight; It Is More Than Likely to Break When a Man Carries a Load over It

Stone Left Unanchored over Week End Was Blown to Sidewalk by Heavy Wind



A Good Practice; Always Hook the Derrick Block to Prevent Its Swinging

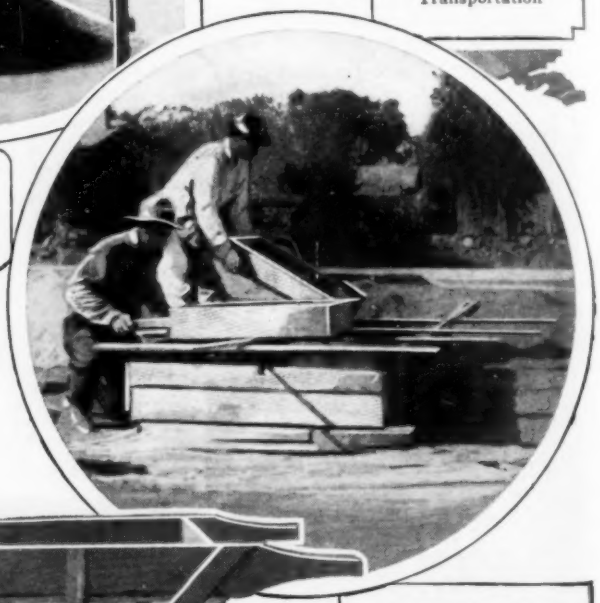
Never Leave an Opening, like That Above, Unguarded; Someone May Think the Level Outside Is the Same as That Inside and Injure Himself Badly; a Few Boards from the Scrap Pile Will Guard an Opening, as on the Right

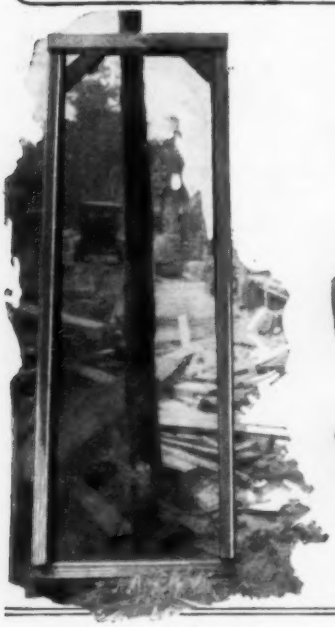
Better Sifters for the Builder

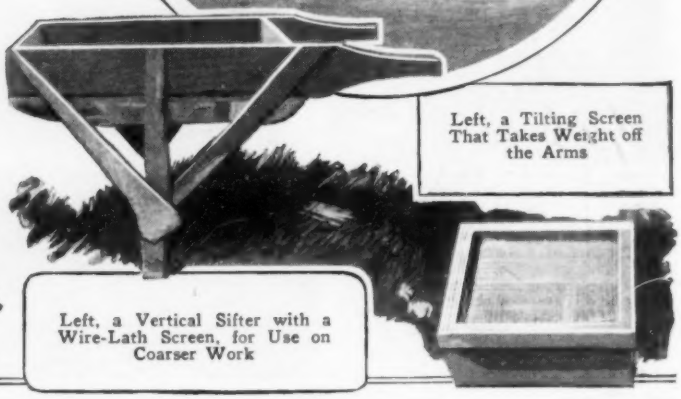
An Easily Operated Screen for Fine Sand; the Screen Runs on Rollers That Are Mounted on the Sidepieces

A Vertical Folding Screen; the Legs and Braces Fold against the Screen for Easy Transportation

The Roller-Screen Idea in Improvised Form; a Piece of Pipe, Resting on Longitudinal Bearers, Forms the Roller; the Screens Have Handles Attached for Ease in Operating







Left, a Tilting Screen That Takes Weight off the Arms

Left, a Vertical Sifter with a Wire-Lath Screen, for Use on Coarser Work

Moving Stationary Engines

I had to move a 1½-hp. stationary gasoline engine for about 100 yd. and there was no one to help me. So I tipped it over, grasped the skids and pushed the engine over the ground just like a wheelbarrow. I found later that it could be pushed much more easily if the cotter pin in the intake-valve spring was first removed. In another case a 10-hp. gas engine was used at different pumps and had to be hauled from one to the other. This was hard to do until we noticed that the flywheels projected a trifle lower than the cast-iron base. Then, by raising the rear cylinder end, putting a mowing-machine axle and wheels under it and bolting it in place securely, we could drag it all over the ranch with one horse.—C. E. Mack, Jr., Sacramento, Calif.

Dumping Boxes Help to Load Wagons

To speed up the work of loading wagons from freight cars filled with gravel and cement, the dumping box shown in the photo was found very helpful. It was hung over the side of the car so that the wagons could be driven directly under it. The workers inside of the car fill the box and when the driver comes to get a load he only has to pull a cord, which releases a catch and allows the bottom to drop open.

Dumping Box for Loading Sand or Gravel into Wagons from Freight Cars

After the contents has been dumped into the wagon, he closes the bottom and adjusts the catch so that the box can be refilled. The box holds 1½ cu. yd. of sand and four boxes can be hung on one car.—R. O. Parks, Beatrice, Nebr.

Self-Erasing Blackboard Used as Bulletin Board by Wisconsin School

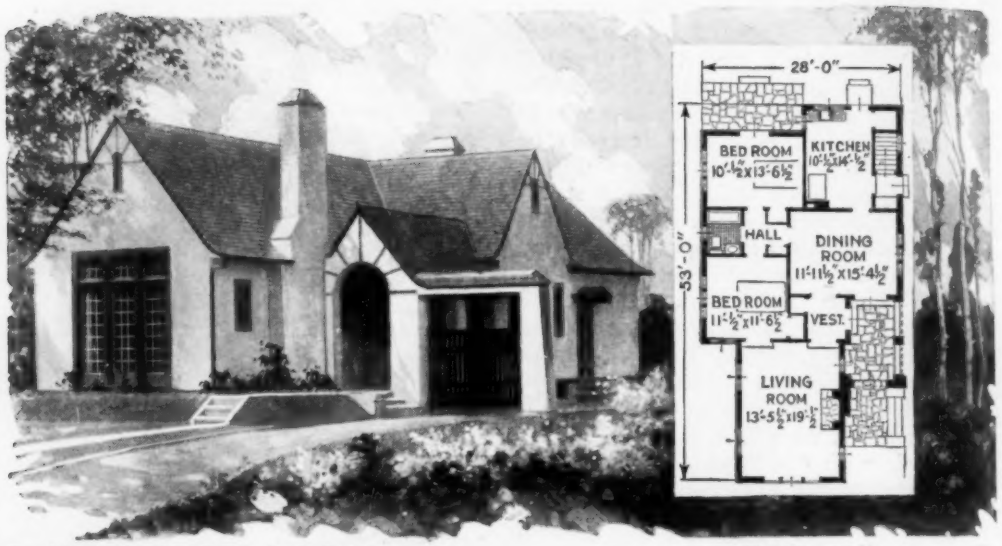
Self-Erasing Blackboard

A self-erasing blackboard is used in a Wisconsin high school for the announcement of school athletics or other school news. It consists of an ordinary window shade and shade roller, the shade being painted with several coats of blackboard paint. The roller is attached permanently to the wall near the entry door. Just below the roller and over the shade, is suspended an eraser, made from a suitable length of pine board covered on the inside with a heavy layer of felt. When an announcement on the board is "dead" and other copy ready, the shade is raised. By pulling the shade down again and pressing the eraser firmly against it, the board is wiped clean for use in an instant.

Handy Stone Boat

Most farmers have occasional need for a stone boat for moving large, heavy rocks. An efficient one can be quickly improvised from a piece of ¼ or ⅜-in. sheet metal, or iron plate, and it is an easy matter to roll the stones on it with a bar. Two iron couplings are riveted to one end to permit the attachment of a chain, which is in turn hooked to the tractor, or doubletree if a team of horses are used.—James Hall, Victoria, Australia.

Is This Your Home?



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Plan No. 5D28

QUESTIONS regarding home building addressed to this magazine will be answered by The Architects' Small House Service Bureau of the United States, Inc., controlled by the American Institute of Architects and endorsed by the United States department of commerce. Inclose 10c and self-addressed envelope. Blueprints, specifications and material list for the house shown here may be obtained at nominal cost. Inclose self-addressed stamped envelope for reply. If further information is desired, send 5c and stamped envelope for a 24-page booklet explaining how the Small House Service Bureau functions and showing 12 sample plans. A new booklet, entitled "Fifty Ways to Lower Home Building Costs," illustrated by ten bureau houses actually lived in, and showing how as much as $1,000 can be saved on a home, may be obtained for 20 cents.

THIS design is an example of what may be done with a house that has its long axis corresponding with the long axis of the lot, and here we see how well this principle may be made to work.

The living room has been given the important position which it deserves. The lighting and ventilation are all that they could reasonably be. Placed in this position, there is a broad expanse of greensward on three sides. Those parts of the house that are more directly associated with family life are placed at the rear. Certainly this living room is the distinct feature of the house. Its floor level has been lowered and its ceiling raised so that there is a clear height of more than ten feet. In the end is a great window, an English addition, and on one flanking wall is a massive fireplace.

One enters the house through a covered portico, beyond which is a vestibule. French doors also open onto the portico from the dining room. The kitchen is placed at the rear, where its connection with services is convenient. Among these may be mentioned a door to the side entry which leads outside and to the basement stairs. There is also a door opening onto the service yard at the rear. At the left, two bedrooms with bath complete the sleeping quarters. At the rear of one of these there is an open terrace.

This design is an especially beautiful one. The high-pitched roof, massive outside chimney, great window in the living room, and gate to the garage driveway are marked by English influences. Here it forms a screen to the garage and adds to the privacy of the rear lot.

The construction is wood frame with exterior finish of stucco and roof of shingles in variegated colors; approximate width of lot, forty feet. The house should be faced to take advantage of prevailing winds and best exposures.